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GLASS



PLATE I. CAMEO VASE WITH BACCHANTES, AUGUSTAN ERA. MRS. W. H. MOORE
COLLECTION. SEE PAGE 156.

GLASS

ITS ORIGIN, HISTORY, CHRONOLOGY,
TECHNIC AND CLASSIFICATION
TO THE SIXTEENTH CENTURY

BY

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ASSISTED BY

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DEDICATION

THIS WORK IS DEDICATED TO MRS. W. H. MOORE
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OF HER GENEROUS COOPERATION.

G. A. E.

PREFACE

ABOUT fifty years ago art lovers found a new interest through the discovery of antique glass in Roman tombs near Cologne. While ever since the 18th century such glass had attracted attention, it was only with the discovery of an enormous quantity datable to the 2d and 3d centuries, A.D., that a new impetus was given to its study.

These discoveries were followed by others in practically every country in Europe, while more recently, many thousands of specimens have been excavated in Syria, Tripolitania, Tunis, Algeria and Sardinia. Through these specimens it became evident that the same types could be found in different countries and that the specimens had been distributed from a few centers of manufacture.

To describe and trace the origin of these glass objects became the life work of a small group of enthusiastic investigators, foremost among them, E. aus'm Weerth, who composed essays with new theories and conclusions on most of the types at his disposal. These investigations were published mainly in the serial, "Bonner Jahrbücher" which thus became the inexhaustible depository of our basic knowledge of antique glass. The crowning publication of all this research is Anton Kisa's epoch-making work, "Das Glas in Altertume" the result of which has been to give the science of ancient glass its proper place, side by side with numismatics, for the proper dating of ancient tombs and tomb objects.

Since the time of Kisa many new types have been discovered and the need of a revision of many of the details of classification, chronology and interpretation has been felt and hoped for by many investigators.

The system followed by the present author was to draw and reproduce in line work as well as in colors, as many specimens of ancient glass and beads as could be found in the museums of Europe and Africa. Later, on his return to this country, the same system was continued in the study of the many public and private collections which had been accumulated after the Metropolitan Museum acquired the Cesnola collection of Cyprian glass and other antiquities. Shortly after these acquisitions the Gréau and Charvet collections were incorporated in the same museum, which later became enriched, also through the gift of Mr. J. P. Morgan, with two collections of Merovingian and Frankish glass. The Curtis collection of Syrian glass, formed in New York, was donated by Mr. Libbey to the Toledo Museum of Art; the Freer collection was deeded to the National Museum of Washington, and other collections were acquired by the museums of Boston, St. Louis, Philadelphia and Brooklyn. Even many private collectors became interested in antique glass, the earliest American collector being the artist C. C. Coleman, whose collection, made in Italy, was described by Russell Sturgis in the *Century Magazine*, Aug. 1894, and later incorporated in the Thomas E. H. Curtis collection. The author has had ac-

cess to all of these as well as to the Fahim Kouchakji collection, part of the latter being now in Berlin, part in New York.

But extensive and important as these resources have been, it was not until the author had the privilege of studying the unrivaled collection of Mrs. William H. Moore that he believed that the time had come for a revision of the subject of ancient glass. Mrs. Moore consented to permit the use of her collection as a basis for the new review, on condition "that it shall contain an account of all principal types so that any collector could, without too much difficulty, classify or identify his or her specimens."

The collections named together with the series of line and water-color drawings, already mentioned, supplemented by numerous photographs, have been used in the composition of the present book. In specimens for illustration, both old and lately discovered types have been included in the line drawings, the effort being to present as many types as possible in a chronological sequence. But for the plates the newly discovered and most artistic specimens were preferred. Where possible the relative sizes of the specimens have been considered in the reproductions, but for the vast majority this was found to be impossible. The line illustrations, originally made by the author, have been redrawn in pen and ink for reproduction by Mr. Edward B. Edwards, who, besides being an artist, is also a discerning collector of glass. The plates are to a great extent made from photographs taken by the author, with others reproduced from procured photographs.

The author has had much assistance from Mr. Fahim Kouchakji, as acknowledged on the title page. He is indebted to Professor R. Delbrueck of Giessen for information and literature; the late Professor William Henry Goodyear, himself an expert on modern glass, gave the author access to the large collection in the Brooklyn Museum of Art and Science, while Mr. W. H. Fox, the Director of said Museum, later furnished a series of photographs of select specimens. Other photographs have been received from Miss Grace D. Guest, of the Freer Gallery, National Museum, Washington, D.C.; from Mrs. Phile Coulder Nye, of Princeton University; through Mrs. Wilford S. Conrow, of New York; from Professor A. Taramelli, of Cagliari, Sardinia; from Professor Berthollini, of Tripoli, Africa; from Professor Mariano Rocchi, Rome, Italy; and from Mr. Henry Kouchakji of Paris. Dr. R. Zahn, of Berlin, Dr. Blake More Godwin, of Toledo, Ohio; Count Kuhn de Prorok of Paris; Mr. Walter Bachstitz of Gravenhagen; Dr. Albert M. Lythgoe of Metropolitan Museum; the respective directors of the national museums of Copenhagen, Amsterdam, Munich, Nuremberg, Treves, South Kensington and the British Museum, have assisted by sending photographs or material for study, all of which have, as far as practicable been acknowledged in the text. Acknowledgment is also made to Mr. Walter M. Patterson of the Printing House of William Edwin Rudge, Inc., for his personal assistance.

G. A. E.

New York, October 1, 1927.

CONTENTS

List of Plates in Color	xi
List of Plates and Figures in Line	xiii
PART I General Reference to Origin: Matrices; Separate Parts; Decorations; Types and Their Nomenclature	I
PART II Dates; Systems of Symmetry; Chronological Periods	85
PART III Classification of Types: Egyptian Periods	118
PART IV Sidonian Period and Its Types	128
PART V Murrhina and Its Identification	170
PART VI Mosaic Glass; Characteristics, Classifications, and Types	174
PART VII Sidonian Rod-Glass, Ritual, Moulded, Lotus Cups; and Stratified Flasks	207
PART VIII Sidonian Glass with Moulded Mythological and Symbolic Figures	231
PART IX First Century A.D.: Pompeii, Tripoli, Sardinia, Syria	277
PART X The Second Century A.D. Period of Glass	315
PART XI Third Century Glass: Syria, Egypt, Germany, Gaul.	375
PART XII Third and Fourth Century Vases with Ground-Out and Engraved Designs	391
PART XIII Domestic Glass of the Third and Fourth Centuries	423
PART XIV The Constantinean Period of Ritual, Amuletic and Symbolic Glass	460
PART XV Gold Glass of the Fourth and Fifth Centuries	550
PART XVI Ritual and Symbolic Glass of the Fourth and Fifth Centuries	582
PART XVII Late Sassanian Plain or Simply Decorated Glass	612
PART XVIII Merovingian, Lombard, Frankish and Byzantine Glass	640
PART XIX Egyptian and Arabic Glass	653
PART XX Glass Representations of the Sacred Vessels in the Legends of the Holy Grail	694
PART XXI Venetian and Other Late Glass	718
PART XXII Chronology of the Origin and Progress of Glass Making	749
Bibliography	751
Index	763

PLATES IN COLOR

In Volume I.

PLATE	I	Cameo Vase with Bacchantes, Augustan Era	<i>Frontispiece</i>
PLATE	II	Urn of Blue Glass with Enamel Decorations, Augustan Era . . .	89
PLATE	III	Pitcher of Blue and White Stratified Glass, Augustan Era . . .	279
PLATE	IV	Mosaic Glass Patella and Lotus Cups, Augustan Era	337

In Volume II.

PLATE	v	The Damascus Gold-Glass Beaker, 4th Century A.D.	<i>Frontispiece</i>
PLATE	vi	Gold-Glass Bottoms, Painted Technic. From Roman Catacombs	575
PLATE	vii	Necklace of Mosaic Glass Medallions representing Christ and Followers	641
PLATE	viii	Arabic Enameled and Gilt Beaker	679
PLATE	ix	The Jerusalem Enameled and Gilt Beaker	697
PLATE	x	Star Bead Glass Vase	721

PLATES AND FIGURES IN LINE

In Volume I.

	<i>Page</i>
FIGURE 1 Mouth Forms of Glass Vessels	12
FIGURE 2 Mouth Forms	12
FIGURE 3 Relative Size of the Mouth	13
FIGURE 4 Lip and Rim	13
FIGURE 5 Upright Collar Rims	14
FIGURE 6 Lip Rim Forms	14
FIGURE 7 Lip Collars	14
FIGURE 8 Types of Trefoil Lip Rims	15
FIGURE 9 Egyptian Mouth Flanges	15
FIGURE 10 Various Types of the Neck	16
FIGURE 11 Types of Junction Between Body and Neck	16
FIGURE 12 Neckbase Bulge	17
FIGURE 13 Types of Neck Decorations	17
FIGURE 14 Shoulder Types	18
FIGURE 15 Shoulder Types	18
FIGURE 16 Neck and Shoulder Types	18
FIGURE 17 Types of Glass	19
FIGURE 18 Loop and Arch Handles	19
FIGURE 19 Loop Handles of Round Rods	20
FIGURE 20 Flat Composite Handles	20
PLATE 1 Moulded and Carved Head in Two Tints of Blue Glass	21
PLATE 2 Core-Wound Glass Vessels	23
FIGURE 21 Waved Handles	25
FIGURE 22 Plate and Tray Handles	25
FIGURE 23 "Finger Ring" Handles	26
FIGURE 24 Horizontal and Basket Handles	26
FIGURE 25 Types of the Upper and Lower Endings of Handles	26
FIGURE 26 Methods of Attaching the Handles	27
FIGURE 27 Loop Handles for Suspending Ring Decorations and Pendants	27
FIGURE 28 Types of Bases	28
FIGURE 29 Base Types	28
FIGURE 30 Types of Bases	29
FIGURE 31 Bottom Forms of Moulded Patterns	29
FIGURE 32 Main Types of Vase Foot	30
FIGURE 33 Types of Stem and Foot Units	30
FIGURE 34 Types of Stem and Foot Units	30

	<i>Page</i>
FIGURE 35	Types of Lamellated Decorations on Mosaic Glass 32
FIGURE 36	Applied Wave Threads 32
PLATE 3	Core-Wound Glass, XVIIIth and XIXth Dynasties 33
PLATE 4	Core-Wound Glass, Egypt 35
FIGURE 37	Dragged Wave Decorations 37
FIGURE 38	Overlaid and Folded Thread Patterns 38
FIGURE 39	Applied Threads, Serpent Designs 38
FIGURE 40	Waves Between Borderlines 39
FIGURE 41	Gutta Drop Incrustations, Disks 39
FIGURE 42	Applied Drop Forms 40
FIGURE 43	Drops Arranged as Rosettes and Grape Bunches 40
FIGURE 44	Applied Petals, Lotus Buds, Disks 40
FIGURE 45	Applied Disks with Figures 41
FIGURE 46	Applied Animal Types 41
FIGURE 47	Salver, Waiter, Trulla, Platter, Paten on Top of Chalice 47
FIGURE 48	Phial, Drinking Cups, Patella, and Patera Bowls 47
FIGURE 49	Measure and Drinking Cups 49
FIGURE 50	Beakers, 3d to 4th Century 49
FIGURE 51	Goblet Types 50
FIGURE 52	Stem Beakers 50
FIGURE 53	Stem Goblets 50
FIGURE 54	Chalice Types. 51
FIGURE 55	Chalices and Carchesium Goblets. 51
FIGURE 56	Pottery Beakers 51
FIGURE 57	Craters and Scodella Types 52
FIGURE 58	Cantharus Goblets with Handles 52
PLATE 5	Core-Wound Amphorisks with Handles 53
PLATE 6	Gold-Glass Bottom with Amor and Psyche in Relief 55
FIGURE 59	Scyphus Goblets 57
FIGURE 60	Scyphus Goblets 57
FIGURE 61	Acetabulum Bowls for Salads 57
FIGURE 62	Calix Cups, Augustan Period 57
FIGURE 63	Cinerary Urns, Storage Urns, Jars 58
FIGURE 64	Lagonas and Demijohns. 58
FIGURE 65	Stamnum or Cylinder Flasks 59
FIGURE 66	Bottle Types 59
FIGURE 67	Droppers 60
FIGURE 68	Ampulla or Ball Flasks 60
FIGURE 69	Holmos and Oil Flasks 61
FIGURE 70	Kotylikos and Prochus Flasks. 61
FIGURE 71	Pitchers 62
FIGURE 72	Wine Flasks. 62

	<i>Page</i>
FIGURE 73 Askos Flasks or Bottles	63
FIGURE 74 Ampulla Jars	63
FIGURE 75 Ampulla Bottles, Common Types.	64
FIGURE 76 Pointed Amphora Jars	64
PLATE 7 Pad-Glass Cups, about 2d to 1st Century B.C.	65
PLATE 8 Moulded and Ground Pad-Glass Cups, 1st Century B.C.	67
PLATE 9 Cinerary Ash Urns	69
PLATE 10 The Olbia Pad-Glass Vase	71
PLATE 11 Cinerary Pad-Glass Urn with Stratified Glass Strips Fused in the Matrix	73
PLATE 12 Pad-Glass with Enameled Painted Scenes	75
PLATE 13 Pad-Glass Craters	77
PLATE 14 Pad-Glass Urns of Blue Glass with Gutta Drops	79
FIGURE 77 Alabastrons, Balsam Vials, Columnar and Ritual Vials.	81
FIGURE 78 Mystic Jar	82
FIGURE 79 Finger Ring of Glass	82
FIGURE 80 Amuletic Bead Coverings of the Omphalos at Delphi.	84
PLATE 15 Scyphus Cups, Augustan Era	91
PLATE 16 The Portland Cameo Vase.	93
FIGURE 81 Development of Diagrams of the Static System	96
FIGURE 82 Dynamic System Diagrams	96
FIGURE 83 Dynamic System Diagrams	96
FIGURE 84 Dynamic System Diagrams	97
FIGURE 85 Dynamic System Diagrams	97
FIGURE 86 Dynamic System Diagrams	97
FIGURE 87 Static System Diagram	97
FIGURE 88 Dynamic System Diagram.	97
FIGURE 89 Static System Diagram	98
FIGURE 90 Static Diagram of Oil Flask	98
FIGURE 91 Dynamic Diagram of Four Sidonian Flasks	98
FIGURE 92 Dynamic System Diagram	99
FIGURE 93 Dynamic System Diagram	99
FIGURE 94 Dynamic System, Syrian Glass.	99
FIGURE 95 Moulded Syrian Vase.	99
FIGURE 96 Static System Diagram	99
FIGURE 97 Two Root-3 Rectangles	100
PLATE 17 The Auldjo Cameo Vase	103
PLATE 18 The Cameo Vase in the Bibliothèque Nationale.	105
PLATE 19 The Naples Cameo Amphora	107
PLATE 20 The Naples Cameo Vase	109
PLATE 21 Corresponding Details of the Naples Cameo Vase	111
PLATE 22 The Campana Beaker, and Arretine Bowl	113

	<i>Page</i>
FIGURES 98-103 Types of Core-wound Egyptian Vessels	120
FIGURES 104-105 Pad-glass Objects of XVIIIth and XIXth Dynasties . . .	120
FIGURE 106 The Sargon Vase	121
FIGURE 107 Late Ptolemaic Pad-glass Vase	121
PLATE 23 Fragments of Moulded Glass and Cameo Glass	123
PLATE 24 Two Moulded Glass Tiles	125
FIGURE 108 Chessmen and Button Beads	131
PLATE 25 Intaglios and One Moulded Relief of Glass	135
PLATE 26 Fragments of Columnar Mosaic Glass	137
PLATE 27 Columnar Mosaic Glass Tile, seemingly a portrait	139
PLATE 28 Fragments of Rectangular Mosaic Glass Tiles	141
PLATE 29 Cups of Columnar Mosaic Glass	143
PLATE 30 Mosaic Glass Plates	145
PLATE 31 Columnar Mosaic Glass Plates	147
PLATE 32 Patella and Patera Bowls of Mosaic Glass,—Columnar Scrolls .	149
FIGURE 109 First Century A.D. Vessels with Foot-base Moulded in One with the Body	151
FIGURE 110 Scyphus Cups, Augustan Era	154
FIGURE 111 First Century Glass	158
PLATE 33 Cups of Mosaic Glass	159
PLATE 34 Plates of Lamellated Mosaic Glass	161
PLATE 35 Cups of Rounded or Flattened Rods	163
PLATE 36 Patella Cups of Moulded and Ground Pad-Glass	165
PLATE 37 Ribbed Banded and Moulded Spherical Cups	175
PLATE 38 Stemmed Bowl with Navel Cup	177
PLATE 39 Ptolemaic Lotus Cups of Silver	179
PLATE 40 Lotus Patera Cups with Moulded Ribs	181
PLATE 41 Lotus Patera Bowls, High Types	183
PLATE 42 Tube-Blown and Stratified Glass	185
PLATE 43 Stratified Glass Vases	187
PLATE 44 Bottle of Blue and White Stratified Glass	189
FIGURE 112 Units of Mosaic Rod Glass	196
PLATE 45 Stratified Tubes	199
PLATE 46 Three-Sided Blown and Moulded Dionysus Bottle	201
PLATE 47 Three-Sided Blown and Moulded Dionysus Bottle, Another View	203
PLATE 48 The Dionysus Beaker	205
FIGURE 113 Sidonian Libation Cups	213
PLATE 49 The Dionysus Beaker, Actual Size	215
PLATE 50 Sidonian Moulded Glass Bottles	217
PLATE 51 Sidonian Moulded Glass Flasks	219
PLATE 52 Sidonian Blown and Moulded Ritual Flasks	221
PLATE 53 The Argonaut Vase	223

	<i>Page</i>
PLATE 54 Sidonian Blown and Moulded Flasks	225
FIGURE 114 Sidonian Temple Series, Represented Sacred Vases	234
PLATE 55 Syrian Blown and Moulded Flasks	235
PLATE 56 Ennion Blown and Moulded Types	237
PLATE 57 Ennion Six-Sided Amphorisk	239
PLATE 58 Sidonian Pyxis of Ivory Paste Glass with Life Symbols	241
PLATE 59 The Neikais Glass Goblet	243
PLATE 60 Syrian and Cyprian Victory Cups and Goblets	245
FIGURE 115 Sidonian, Temple Series Type with Six Represented Vessels in Proper Sequence	247
FIGURE 116 Sidonian, Ornithopolis Series with Storks	248
FIGURE 117 Sidonian, Ornithopolis Series, Nesting Birds	249
FIGURE 118 Sidonian, Represented Objects in the Processional Series	249
FIGURE 119 Sidonian Flask with Life Symbols	250
FIGURE 120 Sidonian Bottle with Palestra Objects	250
FIGURE 121 Sidonian Bottle with Grapes, Pine Cones, and Pomegranates	251
FIGURE 122 Sidonian Bottle with Life Symbols, Possibly Jewish	251
FIGURE 123 Sidonian Bottle with Jewish Etrog Citrons	252
FIGURE 124 The Argonaut Vase	254
PLATE 61 Moulded Syrian Gladiatorial and Victory Vessels	255
PLATE 62 Vessels from Pompeii	257
PLATE 63 Blown and Moulded Beakers from Pompeii	259
PLATE 64 First Century Flasks from Cagliari, Sardinia	261
PLATE 65 First Century A.D. Glass Vessels from Tripoli	263
PLATE 66 First Century A.D. Glass Vessels from Tripoli	265
PLATE 67 First Century A.D. Glass Vessels from Cagliari, Sardinia	267
PLATE 68 Glass Vessels with Gutta Drops	269
FIGURE 125 Glass Vessels from Pompeii	277
FIGURE 126 Pompeian Glass Vases	278
PLATE 69 Paper-Thin Glasses with Buckled Sides	281
PLATE 70 Implements of Glass	283
PLATE 71 Two Cups, Syrian Types, and a Cup Measure	285
PLATE 72 Bowls Blown and with Moulded Shields and Honey-Comb Meshes	287
FIGURE 127 Glass Vessels from Pompeii	289
FIGURE 128 Glass Vessels from Pompeii	290
FIGURE 129 Bottles and Flasks from Pompeii	291
FIGURE 130 Moulded Beakers from Pompeii	293
FIGURE 131 Beakers with Lotus Buds from Pompeii	294
FIGURE 132 Beakers with Moulded Lotus Buds, Pompeii	294
FIGURE 133 Amphorisks from Pompeii	295
FIGURE 134 Aryballos Oil Hand Flasks with Dolphin Handles	295
FIGURE 135 Prismatic and Other Unguent Flasks	295

	<i>Page</i>
FIGURE 136 Pitcher Types of the Augustan Era	296
FIGURE 137 Unguent Tubes, 1st to 4th Century	296
FIGURE 138 Ampulla Bottles, 1st to 2d Century	296
PLATE 73 Blown and Moulded Caput Cup.	297
PLATE 74 Caput Bottles with Bacchus and Eros Heads	299
PLATE 75 Caput Jar with Faun Head	301
PLATE 76 Caput Flasks with Eros Face	303
PLATE 77 Libation Flask with Face of Moon Goddess	305
PLATE 78 Naturalistic, Caput, and Date Flasks	307
PLATE 79 Grape Flask and Grape Jar	309
PLATE 80 Amphorisks, Blown and Moulded	311
FIGURE 139 Blown Vessels with Gutta Decorations	313
FIGURE 140 Prismatic Cubic Flasks from Syria.	313
FIGURE 141 Paper-thin Vessels, 1st and 2d Century	313
FIGURE 142 Measuring Vessels, Modius Types	314
FIGURE 143 Pottery Vessels, 1st to 2d Century	316
FIGURE 144 I—Pottery and Glass Vessels from or near Cologne	316
FIGURE 144 II—From Picardy, 2d to 3d Century	316
PLATE 81 Moulded Flasks, Syrian	321
PLATE 82 Tyche Ritual Flask	323
PLATE 83 Syrian Glasses	325
PLATE 84 Syrian Glasses	327
FIGURE 145 Caput or Head Glasses.	329
FIGURE 146 Six-sided Flasks with Two Narrow and Four Wide Sides.	332
FIGURE 147 I-III—Ampulla Sprinklers	335
FIGURE 147 IV—Low Ampulla Bottles	335
FIGURE 147 V—Ampulla Jars	335
PLATE 85 Sprinklers with Inner Diaphragm	339
PLATE 86 Blown and Moulded Sprinkler	341
PLATE 87 Syrian Sprinklers with Inner Diaphragm	343
PLATE 88 Jars with Moulded or Applied Ribs	345
PLATE 89 Ampulla Flasks	347
PLATE 90 Ampulla Flasks.	349
PLATE 91 Patella Sacrificial Cups and Amphorisk with Bracelet Lip.	351
PLATE 92 Cantharus Cups	353
FIGURE 148 Patella Sacrificial Cups	355
FIGURE 149 Beaker Types from 1st Century A.D. to Arabs	357
FIGURE 150 Beakers with Crenulated Base Ring	358
FIGURE 151 Cantharus and Carchesium Types	360
FIGURE 152 Amphorisks of 2d Century A.D.	361
FIGURE 153 I—Prochus Flasks	362
FIGURE 153 II—Prochus Flasks and Related Types.	362

	<i>Page</i>
PLATE 93 Glass Beakers, Carinated.	363
PLATE 94 Syrian Types.	365
FIGURE 153 III—Flasks with Handles on a Central Neckband	367
FIGURE 154 Represented Vessels, Augustan Era	367
FIGURE 155 I—Cylindrical Flasks, Stamnia	368
FIGURE 155 II—Stamnia, 2d to 3d Century	368
FIGURE 155 III—Barrel Flasks, Frontinus Stamnia	368
FIGURE 156 I—Wine and Oil Flasks	372
FIGURE 156 II—Tall, Tapering Wine Flasks	372
FIGURE 156 III—Wine and Oil Flasks	372
FIGURE 157 Wine Flasks and Pitchers.	373

In Volume II.

FIGURE 158 Vases with Serpentine Threads	377
FIGURE 159 Later Vases with Serpentine Threads	378
FIGURE 160 Vases with Alternating Waves, 3d Century A.D.	379
FIGURE 161 Flasks with Foot-stand	380
FIGURE 162 Chalices, 3d to 5th Century A.D.	382
PLATE 95 Glass Vases with Applied Serpent Threads	383
PLATE 96 Funnel-Shaped Beakers or Lamps	385
FIGURE 163 Cups with Decorated Bosses	387
FIGURE 164 Cups with Superposed Figures	388
FIGURE 165 Vases with Applied Moulded Buds and Scales	389
FIGURE 166 Vases with Proboscis, Tear and Drop Decorations	389
FIGURE 167 I—III—Third Century Vessels with Engraved and Ground-out Decorations	390
FIGURE 167 IV—The Scene of the Worringen Beaker	394
PLATE 97 Amphorisk with Ground-out Ovals and Lines	395
PLATE 98 Glass Vessels with Ground-out Ovals and Lines	397
PLATE 99 The Worringen Beaker.	399
PLATE 100 The Worringen Beaker.	401
PLATE 101 Engraved Blown-Glass Vessels	403
PLATE 102 Two Painted Fragments of an Egyptian Glass Beaker	405
PLATE 103 Cups Painted with Earth Colors	415
PLATE 104 Painted Cups of 3d Century A.D.	417
PLATE 105 Vase of Deep Blue Glass with Painted Ochre Decorations, and Gold-Glass Tile	419
PLATE 106 Painted Glass Bottle	421
FIGURE 168 Third Century Beakers with Ground-out Ovals	423
FIGURE 169 Jars with Ground-out Ovals	423

	<i>Page</i>
FIGURE 170 Third Century Beakers with Engraved Lines and Overlaid Threads	423
FIGURE 171 Beakers of 3d to 5th Century with Foot-stand	424
FIGURE 172 Tumblers and Conical Beakers	424
FIGURE 173 Pear-shaped Ampulla Flasks with Handles Ending on the Neck	426
FIGURE 174 Vessels with Concave Decorations	427
FIGURE 175 Bowls with Pressed Concave Decorations	428
FIGURE 176 Cups and Plates with Twisted Rod Rim	428
FIGURE 177 Basket Jars, 3d to 4th Century A.D.	429
PLATE 107 Moulded and Ground Pad-Glass Flask, and Flask of Yellow Glass	431
PLATE 108 Two Beakers with Ground Lines, and a Prochus Flask	433
PLATE 109 Beakers with Ground-out Hexagons and Ovals.	435
PLATE 110 Basket Jars	437
PLATE 111 Basket Jars	439
PLATE 112 Flask from Kertch in Crimea	441
FIGURE 178 Vases with Extravagant Zigzagged Handles	443
FIGURE 179 Cup Types of 3d Century A.D.	444
FIGURE 180 Ampulla Jars, 4th Century A.D.	445
FIGURE 181 Ampulla Bottles with Wide and Short Neck	445
FIGURE 182 Ampulla Bottles with Narrow Neck	445
FIGURE 183 Ampulla and Canteen Flasks	446
FIGURE 184 Prochus Flasks, 3d Century A.D.	446
FIGURE 185 Ampulla Pitchers, 3d Century A.D.	447
FIGURE 186 Slender Oil and Wine Flasks and Pitchers	447
FIGURE 187 Slender Flask and Pitchers, 3d Century A.D.	448
FIGURE 188 Vases with Flutings and Shallow Arches	448
FIGURE 189 I—Unguent Bottles and Tear Bottles.	449
FIGURE 189 II—Unguent Vials, "Candlestick" Type	449
FIGURE 189 III—Unguent Vials, 3d to 4th Century A.D.	449
PLATE 113 Glasses with Dragged Decorations.	451
PLATE 114 The Large Diatretum Beaker in St. Mark's	453
PLATE 115 Diatreta.	463
PLATE 116 Vases of Uncolored Glass.	465
FIGURE 190 Christian Symbols and Moulded Glass	467
FIGURE 191 Moulded Symbols on Christian Glass.	467
FIGURE 192 Moulded Christian Symbols on Glass.	469
FIGURE 193 Apotheosis of Christ on Moulded Glasses	471
FIGURE 194 Christ Rising from the Grail Chalice	471
FIGURE 195 Holy Cross and Flagellation Column	472
FIGURE 196 Christian Flask with Moulded Symbols.	473
FIGURE 197 Flask with Christian Symbols in Moulded Relief	473
FIGURE 198 Moulded Flask with Christian Symbols.	474

	<i>Page</i>
PLATE 117	Flask, Uncolored Glass, with Convex Decorations 475
PLATE 118	Glass Vase, Convex Decorations 477
PLATE 119	Six-Sided Flask, Uncolored Glass, Relief Decorations. 479
PLATE 120	Six-Sided Flask, Uncolored Glass, Relief Decorations. 481
FIGURE 199	Flask with Moulded Christian Symbols. 483
FIGURE 200	Four-sided Flasks with Christian Symbols 484
FIGURE 201	Flasks with Moulded Christian Symbols 485
FIGURE 202	Flasks with Two Latin Crosses 486
FIGURE 203	Flask with Christian or Sassanian Symbols 487
FIGURE 204	Glass Jars with Jewish Old Testament Symbols 488
FIGURE 205	Symbols on Christian Glass. 490
FIGURE 206	I—Christian Symbols on Glass 490
PLATE 121	Four-Sided Uncolored Glass Flask with Christian Symbols . . . 491
PLATE 122	Four-Sided Christian Flask with Relief Symbols 493
PLATE 123	Six-Sided Flask of Dark Brown Glass 495
PLATE 124	Six-Sided Flask with the Earliest Latin Cross 497
PLATE 125	Six-Sided Flask with Two Latin Holy Crosses 499
PLATE 126	Six-Sided Flask of Blackish Glass with Concave Decorations. . . 501
FIGURE 206	II—Christian Moulded Symbols on Glass. 503
FIGURE 207	Six-sided Flask of Deep Brown Blackish Glass 504
FIGURE 208	Six-sided Flask of Dark Glass with Christian Symbols 504
FIGURE 209	Jewish Symbols on 4th Century Glass 507
FIGURE 210	Symbols on Jewish Glass 507
FIGURE 211	Symbols on Jewish Glass 507
FIGURE 212	Buds and Staffs of Moses and Aaron 508
FIGURE 213	Symbols on Jewish Glass Flask 508
FIGURE 214	Figures on Jewish 4th Century Glass 508
FIGURE 215	Jewish Symbols, Black Glass Series 509
FIGURE 216	Jar of Black Glass with Jewish Symbols 509
FIGURE 217	Cherubim, on Jewish Glass 510
FIGURE 218	Cherubim Angels from Coptic Stelæ 510
FIGURE 219	Christ and Cherubim Figures in Coptic Art 510
PLATE 127	Late 4th Century A.D. Flask of Blackish Glass 511
PLATE 128	Six-Sided Flask of Blackish Glass with Concave Decorations. . . 513
FIGURE 220	Mystic Vases of Thick Heavy Glass 515
FIGURE 221	Mystic Vases, Graffiti or Painted 516
FIGURE 222	Eucharistic Miniature Amulet Vases 516
FIGURE 223	Amuletic Representations of Chalice and Hosts 516
FIGURE 224	Biblical Vessels as Miniature Amulets, Units in Necklaces 519
FIGURE 225	Amuletic Miniature Objects, Represented or in the Round. . . . 520
FIGURE 226	Sacred Vessels as Miniature Amulets. 520
FIGURE 227	Blood, Keys and Nail Amulets 521

	<i>Page</i>
FIGURE 228 Christian Amulets in the Round	522
FIGURE 229 I—Christian Amulets in the Round	522
PLATE 129 Amulets of Glass in the Round	523
PLATE 130 The "Ichthys" or Sacred Fish Symbol of Christ with Attached Seal of Christ.	525
PLATE 131 Christian Amulets of Uncolored Glass, for Necklaces	527
PLATE 132 Syrian Pocket Amulets of Red Clay	529
FIGURE 229 II—Christian Amulets in the Round	531
FIGURE 230 Glass Amulet Disks with Symbols	533
FIGURE 231 Christian Amulet Disks of Glass.	535
FIGURE 232 Clay Amulets from Syria	538
PLATE 133 Four Christian Pottery Lamps, Constantinean Period	539
PLATE 134 The Lazarus Vase	541
FIGURE 233 Bronze Medal Amulet	543
FIGURE 234 I-IV—Christian Symbols on 4th Century A.D. Pottery Lamps from Syria	544
FIGURE 234 V-VII—Christian Symbols, continued	545
FIGURE 234 VIII—Development of the Scene on the Moore Beaker	547
FIGURE 234a, Six-sided Flask of Translucent Uncolored Moulded Glass	549
PLATE 135 The Louvre Plate	551
PLATE 136 Two Engraved Glass Cups	553
PLATE 137 Two Gold-Glass Bottoms with Graffito Figures	555
PLATE 138 Gold-Glass Graffito Bottoms	557
PLATE 139 Glass Bottoms with Gold-Glass Graffiti.	559
PLATE 140 The St. Severin Engraved Glass Plate	561
PLATE 141 Amuletic Reliquary Flasks	563
PLATE 142 Spear-head Vials of Glass	565
PLATE 143 Ritual Vials of Columnar and Saddle-Bag Types.	577
PLATE 144 Jugs of Uncolored Glass	579
FIGURE 235 Christian Miniature Reliquaries.	583
FIGURE 236 Spear-head Vials, Ritual Flasks	584
FIGURE 237 Ritual Flasks for Unguents	586
FIGURE 238 Grape-bunch Flasks, 3d and 4th Century A.D.	586
FIGURE 239 Double and Quadruple Unguent Flasks.	588
PLATE 145 Flasks with Moulded and Stamped Depressed Patterns	589
PLATE 146 Flasks with "Patens and Hosts" Decorations	591
PLATE 147 Heavy, Thick-Walled Flasks	593
PLATE 148 Jars of Thick Pad-Glass	595
FIGURE 240 Animals Carrying Saddle-Bag Vessels	597
FIGURE 241 Flasks and Jars with Christian Moulded Symbols on the Base	599
FIGURE 242 Lotus-pod Decorations on Bottles	600

FIGURE 243	Glass Vessels Decorated with Motifs of Joseph of Arimathea	
	Beakers	600
FIGURE 244	Pitchers, Flask with Sunk and Raised Decorations	601
FIGURE 245	Flasks with Christian Symbols	602
FIGURE 246	Flasks Decorated with Sunk Patens and Raised Hosts	603
FIGURE 247	Types with Shields and Bosses, Patens and Hosts	603
FIGURE 248	Types with Paten Decorations	604
FIGURE 249	Conical Jars from Syria	604
PLATE 149	Animal Reproductions	605
PLATE 150	Jars with Applied Disks and Spines	607
FIGURE 250	Flat Dishes, Moulded Decorations	609
FIGURE 251	Spherical Moulded Jar	609
FIGURE 252	Minute, 4th to 5th Century A.D. Prismatic and Rounded	
	Flasks and Jars	610
FIGURE 253	Sassanian Types with Superposed Disks, 4th Century A.D.	612
FIGURE 254	Ampulla Flasks and Jars	613
FIGURE 255	Ampulla Jars, 4th to 5th Century A.D.	613
FIGURE 256	Vases with Pinched Band Decorations	613
FIGURE 257	Ampulla Jars with Moulded Depressions	614
FIGURE 258	Moulded Jars with Sunk Shoulder, and Sunk, Upright Niches	614
FIGURE 259	Vases with Pinched Catches, about 4th Century A.D.	615
FIGURE 260	I—Thick-walled Vases with Applied Knob Spines	616
PLATE 151	Jars with Cylinder Neck and Thick, Heavy Walls	617
PLATE 152	Jars with Wide Neck and Often Depressed Shoulder	619
PLATE 153	Jars of the Sprinkler Type	621
PLATE 154	Sprinkler Types of Thick Glass	623
PLATE 155	Glasses with Thick Walls	625
PLATE 156	Flasks with Dragged Patterns	627
PLATE 157	Thin-Walled Glass Pitchers	629
PLATE 158	Glass Beakers from Merovingian and Frankish Tombs	631
FIGURE 260	II—Vases with Bulging Body and Exaggerated Shoulder	634
FIGURE 261	Base with Star of Bethlehem	634
FIGURE 262	Water Jars, 4th Century A.D.	634
FIGURE 263	Vases with Dragged Pattern of 4th Century A.D.	635
FIGURE 264	Glass Bracelets	636
FIGURE 265	Oriental Ampulla Flasks, Sassanian Types	637
FIGURE 266	Beakers with Upright Serpents	637
FIGURE 267	Flasks with Body Spout	638
FIGURE 268	Vases with Applied Snouts and Elephant Trunks	638
PLATE 159	Merovingian Glass Beakers	643
PLATE 160	Merovingian Glasses	645
FIGURE 269	Sixth Century A.D. Glasses	648

	<i>Page</i>
FIGURE 270 Two Cups from Castel Trosino	649
PLATE 161 Glasses from Frankish Tombs.	655
PLATE 162 5th to 7th Century A.D. Glass Vessels from Frankish Tombs.	657
PLATE 163 The Chosroes Plate	659
PLATE 164 Two "Hedwig" Glass Beakers of Carved Glass.	661
PLATE 165 Glass Dropper Flasks of Uncertain Date	663
PLATE 166 Glass Weight	665
PLATE 167 Egyptian Glasses	667
PLATE 168 Egyptian Glasses from Fayoum	669
FIGURE 271 Coptic-Islamic Glasses.	671
FIGURE 272 Late Sassanian or early Islamic Glass.	671
FIGURE 273 Vessels Represented on Arabic Glass	676
FIGURE 274 Arabic Droppers, 13th Century A.D.	677
FIGURE 275 Diagrammatic Cross-sections of Arabic Enameled Vessels	677
FIGURE 276 Arabic Glass Beakers of 13th Century A.D.	678
PLATE 169 Egyptian Glasses from Fayoum	681
PLATE 170 Two Silver Plates from Mosul, Mesopotamia	683
PLATE 171 Arabic Glass Dropper	685
PLATE 172 Abasside Enameled Beaker	687
FIGURE 277 Arabo-Venetian, Date Uncertain	691
FIGURE 278 Arabic Lamps of Glass, Enameled Decorations	691
FIGURE 279 Arabic Enameled Glass, 14th Century A.D.	692
FIGURE 280 Arabic Enameled Flasks	692
FIGURE 281 Arabic Enameled Jugs	692
FIGURE 282 Ancient and Medieval Glass Representations of the Grail Objects	695
PLATE 173 Three Arabic Beakers	699
PLATE 174 Enameled Arabic Beaker and The Luck of Edenhall	701
PLATE 175 Arabic Funnel-Shaped Beaker with Stem, and Enameled Cylin- der Cup	703
PLATE 176 Stemmed Chalice, Arabic	705
PLATE 177 Lamp of "The Cup Bearer"	707
PLATE 178 A Cylinder with Cover, Open Base Bottom, Frosted Glass	709
PLATE 179 The Monserrat Beaker with Enameled Decorations	711
PLATE 180 Modern Venetian Glasses, some Imitating the Antique	723
PLATE 181 The Mother and Daughter Vase	725
PLATE 182 The Mother and Daughter Vase, Side View	727
PLATE 183 Hellenistic Marble Bust with Back to Back Faces	729
FIGURE 283 Folded Glasses of Uncertain Date, Ancient and Modern	732
FIGURE 284 Dynamic Diagram of the Mother and Daughter Vase.	735
PLATE 184 Pine Scale Goblet, 3d Century A.D.	739
PLATE 185 The Faun from the Borghese Vase	741

PLATE 186 Etruscan Bronze Mirror, once with Glass Inlay. 743

PLATE 187 The “Augustus” Silver Cup of the Boscoreale Treasure 745

PLATE 188 Arretine and Maara Pottery Cups 747

PART I. GENERAL REFERENCE TO ORIGIN: MATRICES; SEPARATE PARTS; DECORATIONS; TYPES AND THEIR NOMENCLATURE

THE legendary origin of glass refers alone to the invention of the glass matrix as a substance, not to any special form of glass or to any special technic by which glass was formed. Various claims have been advanced for different countries or peoples as the original discoverers, a condensed summary of which follows.

THE CLAIM FOR PHœNICIA. The theory and tradition that Phœnicia was the land to originate glass-making was first advanced by Pliny, the Elder, in his *Historia Naturalis*, II, 36, 66. He tells the following story:

"In that part of Syria which adjoins Judæa, there exists near to the promontory of Mount Carmel a swampy place called Cendevia. At this point we find the mouth of the river Belus (now known as Hadr Alu), which is situated about 5,000 steps from the colony called Ptolemais. Its holy water, made further sacred by divine ceremonies, courses deep and muddy towards the sea. But at the time of low water there is laid bare a narrow strip of sand beach, not more than five hundred steps in length. At this place it is said that a vessel loaded with saltpeter (or soda) stranded, and for lack of rocks the crew, who had landed safely, used chunks of saltpeter to support their kettles while preparing their meal. After the fire had gone down they discovered underneath the fireplace a noble, shining, semifluid substance which was the origin of glass."

That the best quality of sand for glass-making was found near the mouth of the river Belus was well known in antiquity. It was enlarged upon by Strabo, who, placing the locality between Ptolemais and Tyre, added that the sand was taken from this locality to Sidon for further manipulation into glass. Even Josephus Flavius, who, as we shall see, advances another claim in favor of the Jews, relates that on the river Belus, near the tomb of Memnon, is found a mine pit, a hundred yards in diameter, which contains sand suitable for glass. When exhausted, the sand renews itself by being blown in by wind. Tacitus repeats the legend and adds that glass is made from sand and nitre (nitrum). The classical legend was repeated in the 7th century in the works of Isidor, Bishop of Seville in Spain, and in the collection of recipes and anecdotes published under the name of the monk Heraclius, *On the Colors and Arts of the Romans*.

It has been the favorite fashion to condemn, *a priori*, the Phœnician claim, principally on the theory that the heat derived from a cooking fire would not suffice to smelt or fuse sand and alkalis. There is, however, something not incredible in this

claim, and until actual experiments have been made, it should not be condemned offhand.

A more serious defect to this Phœnician theory is that no reference is made to the possible date when this discovery took place. As glass was already in use in Egypt, though to a limited extent, in the XIth to XVIIIth dynasties, the discovery of the Phœnicians in order to have priority should have been made about the time they first settled in Syria, about 2000 B.C. But as far as we now know, until the present day no such early glass has been discovered in Phœnicia, certainly none which can be much older than the 9th century B.C. It should be remembered, though, that even this date is not quite settled and we may eventually have to accept, if proven, the theory advanced by Flinders Petrie in a lecture, before the Sheffield Society of Glass Technology, (according to *Nature*, July 31, 1926, p. 178), that certain glass objects recently found in the Euphrates region of Syria are associated with objects of the astonishingly remote date of 2500 B.C.

In another paper on Antique Glass the author has suggested that glass was discovered as a result of hardening of glaze, and that this was known to the Egyptians since predynastic times, but that glass might also have been, and probably was, independently discovered in different places and at various times, where the imperfection of the technic prevented its general use for practical purposes.

THE CLAIM FOR EGYPT. The claim of Egypt as the site of the discovery of glass has until recently been based upon the wall paintings of certain 12th century tombs of Beni Hassan, in which representations of workmen with blow pipes before fire have been identified as scenes of glass-blowing. But as blown glass can not have been made before the 1st century B.C., it is now generally admitted that the scenes in question represent some other craft, not yet satisfactorily determined.

It has, however, long been known that minute glass amulets were made in Egypt during the XVIIIth dynasty, a date extended by Winlock, who has described beautifully made, minute glass beads from the tombs of the XIth dynasty (*Metropolitan Museum Bulletin*, Part 2, p. 63, Nov. 19, 1921), 2000 B.C.

THE CHINESE CLAIM OF GLASS INVENTION. There have not been wanting theories that glass was first used by the Chinese, but until now no finds of ancient glass have been discovered in Chinese tombs, which on the whole have been little excavated by archaeologists. There are, however, certain written references in Chinese literature that "ten distinct colors of glass matrix were imported from the Roman Empire in the period 221-266 A.D."

THE GLASS MATRIX

THE GLASS GROUP. The various substances which make up the connected group which can be termed the Glass Group, consist of glaze, glass and enamel, each of which possesses distinct qualities and characteristics. These terms should therefore not be applied promiscuously. The substances are also chronologically distinct as regards their origin and on that account possess an historical importance in the history of arts and crafts.

THE GLAZE. The glaze is a more or less fluid or viscous liquid which contains substances which when hardened resemble glass or constitute glass. The art of glaze was known to and used by the ancient prehistoric Egyptians, that is, previous to the 1st dynasty, for they possessed the art of glazing pottery and stone. The glaze was either uncolored or colored. At first the color was greenish and yellowish and it was only after a thousand or more years of application that intensely-colored glaze in red, blue, green and yellow came to be invented.

NATURAL GLASS. Natural glass is a substance found in rocks of certain geological formations. The most common variety, known as "obsidian," is black and faintly transparent or translucent, reflecting in strong light a brownish tint. It occurs in all volcanic regions, generally in spherical or rounded nodules of varying size. The barbaric natives used obsidian for arrow and spear points, but the Egyptians either fused this glass or in some instances shaped it in its natural state into beads. The high temperature of fusion made this glass unsuited for general use. It seems probable that this type of glass gave origin to, or suggested, the making of artificial glass.

ARTIFICIAL GLASS. Artificial glass is, as we have said, a mechanical composition of finely ground or even pulverized substances, fused at great heat without the admixture of liquids except in exceptional instances in order to convey to the mixture certain salts alone soluble in liquids.

This substance glass was known to the Greeks as "hyalos," meaning translucent. The Latins called it "vitrum," from *videre*, meaning to see through.

The constituents of early ordinary glass were sand, soda or potash, called nitre or nitrum, and certain metallic salts such as sesquioxide of lead or bioxide of manganese, etc. Saltpeter, too, is found in early glass and, as the art developed, innumerable other substances were added in order to vary the hardness, fusibility and the color of the glass.

GLASS OVENS. The only safe manner in which to ascertain the place of manufacture of antique glass is to discover the actual oven or the refuse of glass thrown out of actual manufacturing places. Investigations of such places have, however, never been made with sufficient accuracy, and with full knowledge of the subject and its importance. The finds have always been accidental. The oldest are those of Tel el Amarna in Egypt, where three or four different factories were found and described by Flinders Petrie. Others have been found at Tyre in Syria, and the writer has been told that years ago one was found outside of Porta del Popolo in Rome. In France ancient factories of glass have been excavated at Lyons, in Marne, in Vendée, and in Poitou; in Belgium at Namur; in Germany at Worms, with specimens in the Museum of Wiesbaden; in the Eifel mountains; at Trèves and at Cologne. In England, factory remains have been found at Wilderspool. The latter are most important because they date from the time of Trajan. There, together with fragments of glass, were found ingredients of copper, lead, chalk, lime and other substances entering into the manufacture of glass.

PRINCIPAL TYPES OF ARTIFICIAL GLASS

OPAQUE GLASS. This type was produced before the translucent glass, and the translucent was made before the transparent glass. The earliest Egyptian amulets of glass date from the XIIth to the XVIIIth dynasty and were always made of opaque glass. This was either uncolored and dull or highly colored. The dull, uncolored bead marked with the cartouche of Queen Hatshepset is of this kind, though some believe it made of natural glass, or obsidian. The colored opaque glasses of the XIIth to XVIIIth dynasties are very attractive, principally because the colors are soft and harmonious, never glaring. The soft coloration was often due to impurities, such as lime, manganese and magnesia. Traces of lead and zinc gave opaqueness, but metallic compounds produced colors. The chemical analysis of ancient Egyptian glass reveals the same substances as used in glass-making now, but as specimens of the glass analyzed chemically were never preserved, we are at a loss to understand what varieties were analyzed. As a rule it can be said that copper and cobalt produce blue; iron, yellow; lead and zinc, opaque white, or in proper combinations, so-called lead glass, uncolored transparent glass. In the XVIIIth and XIXth dynasties, roughly from 1500 to 1000 B.C., the art of imitating many kinds of semi-precious stones had advanced, and many beads sold in Egypt as precious are made of colored glass.

UNCOLORED TRANSPARENT GLASS. The uncolored transparent glass, resembling uncolored quartz, was invented in the 9th to 8th century B.C., a time when we first find it in small quantities in Italian tombs, mostly in the form of beads. These beads of various sizes, generally as large as hazelnuts, are of a fine, brilliant transparency and without a trace of color.

Glass vessels made of pure uncolored glass do not appear until the 1st century A.D., and in quantity not until the 2d.

TRANSLUCENT AND TRANSPARENT GLASS. Let it be said again that a distinction should be made between translucent and transparent glass. Translucent was known at least since the XIth dynasty, but transparent uncolored glass was invented about 800 B.C. and appears in Italian tombs of the 9th to 8th century B.C. Translucent glass transmits light, but transparent glass transmits also the forms of objects.

IVORY PASTE GLASS. This name has been given to a certain opaque, non-reflecting glass used by the Sidonians of the 1st century B.C. in the making of various small objects, such as the "temple flasks," heads of deities, in band glass, etc. It occurs as opaque white, as clay blue, as emerald green and even as red. The art of making this glass was lost in the 1st century A.D. No later glass equals this in beauty.

DETERIORATION. Glass when exposed to the air, and especially to moist earth, decays from the surface down. The upper part of the glass separates into layers, and the inner parts granulate or pulverize. Even when exposed to dry air the surface becomes in time spotted, and later pitted. This deterioration is impor-

tant in the study and classification of glass, because it often informs us of the origin of the glass, the country where it was made, the country where and conditions under which it was buried, and finally the composition of the glass. The color of the decay should be noted. Much of the dead lead-coloration is confined to the 4th century A.D. The form of the pits and the sores should be noted. The Egyptian glass decayed less readily than the Syrian glass, and the German glass never assumed the fine iridescence so highly prized in Syrian glass.

THE IRIDESCENCE. The iridescence is due to the separation in thin layers of the surface of the glass, the colors and brilliancy of the glass being due to the refraction of the light from layer to layer, as in ordinary prisms. Certain kinds of glass do not assume an iridescence and thereby supply important points for study and classification. The iridescence of glass can be temporarily destroyed by application of water, but is resumed when the water evaporates.

THE SURFACE PATINA. While the iridescence reflects light and displays different colors, the patina is dull and resembles a coating on the glass. It is rarely iridescent, but mostly dull, solid looking, and hard. It has the appearance of a paint or a powder, and its appearance often suggests the date of the glass. It is due to oxidation, and this lack of transparency makes it most unpleasant to behold. Still, it should never be removed mechanically, but might be modified by an application of mineral oil. It is often strongly attached to the lower or under matrix and differs in this from the iridescent layers which fall off by themselves, even when handled with great care.

ODOR OF GLASS. Ancient glass always possesses a strong odor of earth and mortar, which becomes especially noticeable when the glass is moistened. Immerse an antique glass in water and it at once smells earthy. This property is never possessed by modern glass imitating the antique glass, and it thereby enables us to detect the antique from the imitation when other tests fail.

MAIN TECHNICAL TYPES OF ARTIFICIAL GLASS

THREAD OR CORE-WOUND GLASS. This glass was extensively in use from the XVIIIth dynasty to the time of the early Roman emperors, but went out of fashion after the discovery of tube-glass. It consisted of winding semi-fused threads or rods of glass around a core made of sand held in position by some adhesive soluble in water. When the vase or bead was shaped the surface was fused and smoothed down and the sand core scraped out. The method was in use as late as the 3d century A.D. in imitating old Egyptian alabastrons.

PAD-GLASS. This type consisted in spreading fusing glass on a marble platter and rolling it into sheets. In making vessels of this glass the base, foot, neck and lip rim were made separately and fused together. Hence the walls are extremely thick and heavy. After cooling the surface was ground down. Such pads were also pressed in moulds. Drinking cups of semispherical form without handles were made in this manner during the time of the later Ptolemies, and perhaps even earlier.

TUBE-BLOWN GLASS. This glass followed the pad-glass. It was made of a pad of glass folded upon itself in the form of a tube. The lower end of the tube was closed, and by means of a metal tube inserted in the open end the lower part of the tube was enlarged. All the early flasks previous to the 1st century B.C. were made in this manner when not made with core-wound threads. This technic never died out, but was discontinued after the invention of bubble-blown glass.

STRATIFIED RODS. This type is merely pad-glass made up of different rods of glass of different colors. The rods were placed side by side, fused into a pad, rolled into a tube or simply twisted into a cylindrical flask with closed and pointed base. The tube was blown out in the manner already described. After fusing and forming the vase, the surface was ground down to shape. This type probably preceded the glass made of stratified layers, to be described next. But it never died out entirely, its simplicity causing it to survive the more elegant stratified-layer glass.

STRATIFIED-LAYER GLASS. For short this type might be termed stratified glass. It differs from the stratified-rod glass in that the stripes are derived from strips of layers instead of rods. The process consisted in placing layers of pad-glass on top of each other and cutting them up into strips after fusing to adherence. From a layered strip a tube was formed and the vessel prepared in the manner already described. Many types exist, to be described later. This type went out of fashion with the time of Augustus, but from it the finest antique glass was made in the 1st century B.C., never afterwards equaled by any method.

MOULDED PAD-GLASS. The easiest way to form a pad-glass was to press it in a mould consisting of one or more parts. Specimens of moulded pad-glass are quite common and the art of making it, once it had been invented, continued to be practiced until modern times. Moulded pad-glass is always characterized by its thick walls and heavy weight. It was first used for ordinary truncate-ovoid drinking cups, which, on account of their thick walls, were not readily subject to breakage. Other specimens had the form of bowl flasks which were made of two separate parts, each moulded separately and united by fusion. The decorations, when any, were either moulded or stamped on the surface as in Arretine ware.

BUBBLE-BLOWN GLASS. In this type the glass vessel is no longer blown from a tube but from a bubble by means of a blow pipe. The type is a direct development from the tube-blown glass technic, the difference being that whereas in the latter the glass matrix was first made into a tube, in our present process the bubble is produced directly from a formless particle of fused glass matrix, enlarged in the same manner as a soap bubble. The art was entirely unknown to the ancient Egyptians, no bubble-blown glass having been found in tombs earlier than the 1st century B.C. The technic was probably invented by the Sidonians, who produced wonderful but small bubble-blown vessels in the time of Augustus. There are, however, certain indications that the art was already known in its rudiments in the 5th century B.C. to an artistic glass-maker. The reason for this belief is that in the museum of Bologna, Italy, there is in the 5th century B.C. series a type of bead which seems to have been made directly from fused glass by means of a blow pipe. These beads

appear to be hollow and with a flattened or compressed turbinate body, with projecting cogs along the equatorial. The beads are about 3 centimeters wide and 1.5 high. Some of them possess a little narrow neck and wide lip rim at one end of the bore, and thus imitate the form of a wide and flat flask like the Greek "lekane" of this period.

The examples copied by the author were in case E, No. 459, from "Predio Arnaldi," near Bologna. The writer had no opportunity to handle the beads at his leisure, and further investigation might lead to a different theory.

From that period on to the 1st century B.C. no similar objects are known nor are there any glass vessels which even remotely suggest that they were made directly from a bubble of fused glass.

BLOWN-IN-A-MOULD GLASS. The invention of blowing a bubble in a mould in order to produce a certain correct form, or for the purpose of reproducing on its surface certain decorations in relief, was perfected almost at the same time as the discovery of blowing glass from a bubble. The invention was undoubtedly made by Sidonian and Tyrian artists, many hundreds of specimens of their work now existing in our museums and collections. The vessels were mostly small, but of exquisite form with delicate decorations made of artistically superior varieties of glass matrix, never equaled, much less improved on, in later times. In fact, their art, which reached its perfection in the time of Augustus, soon so deteriorated that within a century it had lost both its beauty and its perfection. As the quality deteriorated the vessels gained in size, always an indication of the ruin of all true art.

MOSAIC GLASS. Mosaic glass is a special glass technic containing many types. Mosaic glass consists of various units of differently colored or uncolored glass, so arranged as to form different patterns. According to the nature of the pattern, different technics were used, so that we can now separate a whole series of varieties, such as surface mosaics, matrix mosaics, and imbedded mosaics, further divisible as breccia mosaics, columnar mosaics, gutta or drop mosaics, rod-glass mosaics and stratified-layer mosaics.

Some of the mosaic types were already in use in the XVIIIth and XXth Egyptian dynasties, but it was only after the invention of the columnar mosaic rod had been perfected that mosaic glass attained such popularity as to supersede almost every other type of glass. The finest period of this glass is in the time of Augustus, before bubble-blown glass had yet come into general use. Mosaic glass technic was unsuitable for very large vessels and difficult to apply to the making of flasks. Hence it was pushed aside when the taste developed for very large objects, a taste which went hand in hand with Roman imperialism, for there everything had to be large in order to satisfy the public craving for size rather than quality. The final step in this art was its use in wall decorations. After that the art degenerated but was never lost.

Mosaic glass is in reality a type of pad-glass in which the matrix is made up of well defined units of different colors, assembled when cold and solid, and afterwards fused to adherence. The mosaic glass technic included the use of a base matrix upon which the mosaic units were assembled before fusing. After fusing, this base matrix

was removed by grinding and scraping, which was continued until the mosaic body possessed the required thinness and outline.

As has been said, mosaic glass comprises many varieties divisible into various classes. These must be properly differentiated when a specimen of this type is described, for only through such minute description and definition can the nature of this type of antique glass be distinguished from later imitations. Such classification is not alone of scientific and artistic interest, but many times of great economic importance, involving a question of thousands of dollars, the price sometimes paid by the ignorant for unimportant imitations.

PARALLEL-ROD GLASS MOSAIC. Series of parallel rods were laid side by side on a support and fused into a pad or sheet. When too thick the pad was ground down and the surface made even, but in some instances these vessels show the convex outlines of the rods on their surfaces. Instead of plain rods, rods of different colors were used in regular recurrence and were sometimes enhanced also by gutta drops and short surface streaks of different colors. Rods with trina spirals in the interior were often employed, both as the main matrix and as edgings. Vessels made of this type of glass were in use in the time of Augustus. They are of indifferent artistic merit unless they have been mixed with plain rods and bands. The art of making entire vessels of parallel rods was brought to a perfected state by the Venetians and this constitutes the only really artistic technic in which they excelled.

CAMEO GLASS. This type of glass was suggested by the semiprecious natural onyx stone, with alternating layers of translucent and opaque matrix. It was made by covering a transparent glass matrix with an opaque, generally white, matrix, the white layer being on top of the transparent one, so that figures and designs carved of the latter would show on a distinct background. Innumerable fragments of cameo glass are in our museums, the best being from the time of Augustus and Tiberius, after which time the art of carving degenerated, first in design, later also in technic. The four entire, or restorable, cameo vases best known are the Portland, the Naples, the Moore and the Curtis (now in the Toledo Museum), the latter two being in the United States. This art was lately imitated in pottery, which would have been admirable but for the disagreeable tint of the blue background and the too glaring whiteness of the reliefs.

COLUMNAR-ROD GLASS. The rods in this type were fused in upright positions and in parallel arrangement. Never in use except in columnar mosaic glass, invented in the 1st century B.C.

STRATIFIED GOLD-GLASS. A layered gold-glass consisting of two layers of transparent glass matrix, with between them a layer of gold film, or in rare instances gold enamel. Of this material and in this technic were executed gold-glass beads in the time of the Ptolemies and continued to the Renaissance. Another type consisted of gilt reliefs of glass, covered in a similar manner with transparent glass. A third type consisted in covering a plain glass surface with gold leaf and, after causing it to adhere by some gum or mastix, scratching in it designs with figures of plants, animals and personages, according to the style of the time. The gold-glass reliefs

are known in but one entire and few fragments, datable to the 1st century B.C. The gold-glass graffiti became common enough in the time of Constantine, some four hundred specimens being known. The gold-glass beads, begun in the time of the Ptolemies and continued in use ever since, were made with constantly increasing loss of skill and taste. Instead of gold, silver was also, but rarely, used. In the degenerate beads of the Roman empire, white and yellow paint enamel was sometimes substituted.

In order to prevent the two layers of glass from separating, caps of glass were fused to the ends of the beads, but in the case of graffiti and gilt reliefs in which the gold did not reach the ends of the layers, such precautions were not necessary.

The Venetians "improved" upon the process but substituted modern, complicated, shaded designs for the simpler ancient graffiti without shading, a style through which their imitations are now readily recognized.

JEWISH GLASS. Efforts have been made by various writers to prove that the Jews manufactured glass from time immemorial, and that glass was already in use in the reign of King Solomon. These assertions are partly based upon statements in the Bible and in the Talmud, all of which have been hunted out and quoted by Hamberger and Michaelis in the publications of the Göttingen Society, IV, pp. 27, 58. It is now known that these quotations are due to incorrect translations of certain words which are rendered as *glass* instead of *crystal* or some similar natural substance. Nor has any glass of very ancient date been found which can with certainty be attributed to Jewish workmanship. The account given by Josephus of the Jewish discovery of glass is not credible, because in a forest fire the resulting heat is not sufficient to fuse ashes and sand into glass. Nor do trees grow in alkali of sufficient purity to produce glass.

It is, however, possible that the Sidonian and Tyrian manufacture of glass gradually fell into the hands of the Jews, but there is no evidence of this in the early vessels, for only in the 4th century was glass made with characteristic Jewish symbols. The period of Jewish glass might thus have begun in the 4th century. It is also apparent that the Jews themselves had little or no knowledge of the history of glass, as evidenced by statements in the Talmud, which are to the effect that the art of making uncolored glass had been lost since the destruction of the Temple of Solomon. The oldest uncolored pure glass known dates from tombs in Italy of the 9th and 8th centuries B.C. The writing just mentioned could therefore only have been made at a time when uncolored pure glass no longer existed. As it did continually exist from the 9th century B.C. to the 5th A.D. it follows that the statement in the Talmud was made at the latter date.

In the 4th century, however, flasks of very dark glass with Jewish designs and symbols were made. In the 6th century Jewish makers of glass had settled in Constantinople and there is an often repeated tale to the effect that a one-time Jewish glass-maker tried to throw his son in the glass oven because the latter had become a Christian convert, and that the boy was saved by the direct intercession of the Holy Virgin.

In the 7th century Greek workers in glass emigrated from Constantinople to Gaul in order to work in glass "according to the Jewish method," which shows that Jewish glass had acquired some fame. A book including recipes of the 9th to 12th centuries, attributed to Heraclius (10th century A.D.), *On the Colors and Arts of the Romans*, III, 49, describes the manufacture of Jewish glass by means of lead salts, resulting in lead glass (*vitrum plumbeum*), which Kisa in his work on glass assumes to be uncolored glass, although this is not proven by fact, as uncolored glass seems to have been practically unknown at that time. Theophilus, a German monk (11th-12th century A.D.), who gives recipes for such glass, but not sufficiently detailed to be intelligible, did not really know ancient glass.

That already in his time Hebron was the main place of glass-making is believed by Kisa (pp. 6-16, 200, 280, 842, etc.). Hebron is also at the present time the seat of a Jewish glass industry, its principal manufacture being glassware, beads and arm rings, as well as amulets, which are sold to the Arabs and the Bedouins.

QUALITY OF THE JEWISH GLASS. Kisa in his book (p. 99) accepts the theory that the glass industry fell in the hands of the Jews during the Middle Ages and that the assumed superiority of their glass consisted in its transparency and lack of color, in other words, in its purity. But Kisa, or any one else, has failed to point to any specimens of such Jewish glass either by description or representation, which makes it impossible to affirm the truth of this theory. The few existing pieces of glass with Jewish symbols, known to belong to the 4th and 5th centuries A.D., introduce us for the first time in the history of glass to a degraded, almost black, glass, nearly opaque, never transparent and but faintly translucent. Nor are there any glass vessels known from the early medieval period which on account of their form point to a specially Jewish origin. Even Jewish archæologists have failed to point to any extant Jewish glass. Until such glass is found we must believe that the term Jewish can only apply to a limited number of makes of coarse form and coarse quality, and that the name Jewish was given to glass because it was sold by and distributed by the Jews. A great deal of this and other medieval glass can, however, be referred to as Christian glass, partly because it contains Christian symbols, partly on account of its form. Christian chalices, for instance, were known already since the 2d century A.D. Fine glass was not produced during the medieval age until the advent of Byzantine glass-makers, but especially not before the coming of the Arabs.

IMITATIONS. Imitations in glass of precious stones were as common in classic antique times as to-day. Seneca warned against imitations of emeralds, and Pliny has treatises on the manufacture of precious stones. Azure blue was made with oxide of copper, silicates, alkali, cobalt, lime and oxides. Turkish blue was made with oxide of copper; red, with copper oxides and copper filings; violet, with manganese oxide; green, with oxide of lead; emerald green, with copper oxides and gold and saffron yellow with chloride of silver; black, with manganese and iron. Opaque white was made with tin.

| The most famous imitation now known and extant is the Sacro Catino bowl in

San Lorenzo in Genoa, long considered as a priceless emerald, once so highly valued that it was accepted by the Genoese as full payment for the use of their fleet by Alfonso VIII of Castile at the siege of Almeria of the Moors in Spain. The admiral of the fleet, Guillermo Embriago, presented the bowl to the cathedral in Genoa, where it is now. It was taken by Napoleon to Paris, but was restored after his fall. During the transit it was broken and it was then discovered to be of glass. Marvelous imitations like this but of small size were not uncommon among the Sidonian glass-makers in the time of Augustus; and some few bottles of this glass are known to collectors.

Most imitations were used for beads, the deception being facilitated by the faceting and grinding of the stones to resemble natural or artificially produced crystals. Such crystal grinding became common in the early Roman empire. It can be easily recognized by holding the stone to the lips. If it produces a sensation of warmth it is of glass, but if it feels cold it may be a crystal or even a precious stone.

Not alone precious stones, but other precious materials were imitated. Salonina, the wife of Emperor Gallienus, whose colossal bronze statue can be seen in the Metropolitan Museum, bought a string of beads from a dealer, being assured they were genuine and priceless, only to discover afterwards that they were glass imitations.

Onyx, alabaster, malachite, lapis lazuli and even marble were also imitated. These less important imitations flourished at the time of Augustus and Tiberius but disappeared or became rare with the wholesale manufacture of pure, uncolored glass in the 2d century A.D. Several cups and vases, upon discovery described as onyx, are onyx glass. It is a question in the mind of the author whether the famous Valencia cup, said to be of onyx, is not really of onyx glass. The fact that both materials were used at the same period would in no way decide for or against the supposed sacredness of the vessel, and so the authorities of the Valencia Cathedral would neither gain nor lose by permitting an expert's examination. Glass as a material for such cups, is, if anything, the earlier substance out of which they were made.

SEPARATE PARTS OF THE VESSELS

THE MOUTH. The mouth is the uppermost part of the vessel, and is best defined as the area and opening which gives access to the vessel. The edge of the mouth is called the lip and lip rim. The latter is sometimes lacking.

CIRCULAR MOUTH. The primitive form needs no explanation. It is circular when viewed from above. The circular mouth can be flat, funnel-shaped or cup-shaped. In either case, we must make a distinction between the upper opening and the lower opening, the latter sometimes a mere diaphragm.—Fig. 1, *a*.

MOUTH WITH PLAIN SPOUT. The opening is more or less almond-shaped, drawn out at one end, rarely at two opposite ends.—Fig. 1, *b, c*.

TREFOIL MOUTH. The upper mouth area has the form of a clover leaf or trefoil, when viewed from above. Below the trefoil and in its interior is the neck opening or throat entrance. The trefoil is always produced by pinching and the leaflets

are often unequal in size, one forming a spout and the others wings for preventing the liquid from flowing over the neck.—Fig. 1, *d-f*.

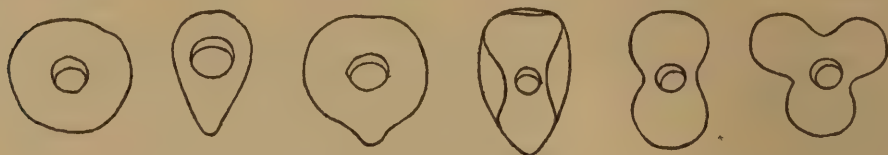


Fig. 1. Mouth forms of glass vessels.—Plain, with spout—trefoil.

DROP MOUTH. A diminutive opening at the apex of a narrow, tall neck, without diaphragm, in dropper flasks. This type is especially common in Sassanian and Arabic vessels used at the bath.

The modern form of sprinkler mouth with many circular openings on a convex disk has until now never been observed in ancient glass vessels.—Fig. 2.

CUP AND FUNNEL MOUTH. The mouth and upper part of the neck has the form of a cup with outward curved sides, or of a funnel with straight sides. The base is some distance down the neck and therefore of a conspicuous size and form. The form was derived or inherited from the mouth of the Greek *lekythos* and *aryballos*, both destined to contain oil. The cup prevented the oil from bubbling out, and facilitated the return of the oil to the vessel without waste. Pottery vases with such mouths are described by Miss Richter, *Shapes of Greek Vases*, Metropolitan Museum, New York, 1922, pp. 25, 26, 27. 2d and 3d centuries A.D. Often found in glass vessels 1st and 2d centuries A.D.—Fig. 2.



Fig. 2. Mouth forms.—Drop—cup—funnel and plate mouths.

PLATE MOUTH. The mouth and lip have the form of a wide, slightly concave plate or saucer, as in certain ceremonial water jars, resembling a paten placed on the top of the neck.—Fig. 2.

SIZE OF MOUTH. Either full, wide or narrow. The full mouth is almost as wide as the body proper at the shoulder. The mouth is wide if about one-half to one-third the diameter of the body at the shoulder. It is narrow when it is but a fraction, such as a fourth, fifth or sixth the diameter of the body. It is termed "pinhole" or drop mouth when it appears like a small hole, in the center of a wide disk, or at the end of the neck, as the long-necked droppers. The mouth is full in some jars and

pitchers. It is wide in most jars and jar bottles. It is narrow in flasks and bottles, and in most all vessels for storing liquids.—Fig. 3, *a-e*.



Fig. 3. Relative size of the mouth.—Full, wide, narrow, pinhole mouth.

THE MOUTH LIP RIM. The upper part of the neck ends in a mouth, the form of which is of considerable importance in dating the vessels. The important matter in connection with every type is to know when it first appeared. The time when it disappeared can rarely be determined, because most, if not all, types disappeared gradually. The following are the most important:

NECK WITHOUT LIP RIM AND FLARE. This, the simplest form, is often found in the 1st century, but continued sporadically. In the 5th century it became once more fashionable, the cylindrical neck being simply cut off horizontally.—Fig. 4, *a*.

NECK ENDS IN A FLARE WITHOUT RIM. The upper end of the neck is slightly widened but without rim, a type often found in the 1st century A.D.—Fig. 4, *b-d*.

RIM TURNED OVER. Edge ends in an overfold of the rim, producing a low, plain collar. This plain form was favored in the early years of glass-making or in early Sidonian glass in general.—Fig. 4, *e, f*.



Fig. 4. Lip and rim.—Plain, flare, collar.

UPRIGHT CONTRACTED RIM. This type of lip rim is found only in Sidonian and early 2d century pateræ derived from the Hellenistic Megarian bowls which all possess this characteristic. The rim is upright but set in, so that the diameter of the whole rim is considerably less than that of the patera or bowl proper. The rim is always low, either perpendicular or slanting. In the later 2d and 3d centuries patera, or bowl plate, the rim is as wide as the shoulder and not greatly set off.—Fig. 5, *a-d*.

DIAGONAL RIM PROFILE. The outer profile or margins of the lip, viewed on a plane or level with the mouth, is sloping and sharply set off from the neck proper. A turn-over, or short collar, is generally present at the same time.—Fig. 6, *a, b*.

FLAT OUTSTANDING RIM. The upper surface of the rim is entirely flat, and when viewed from the top appears like a circular disk without funnel-shaped approach or junction with the neck. This type is characteristic of a series of vessels of

the 4th century, including the revived forms of toilet amphoræ with dragged decorations in imitation of the Egyptian style of the first millennium B.C. The character is of such importance as to suggest at once the 4th century date of any

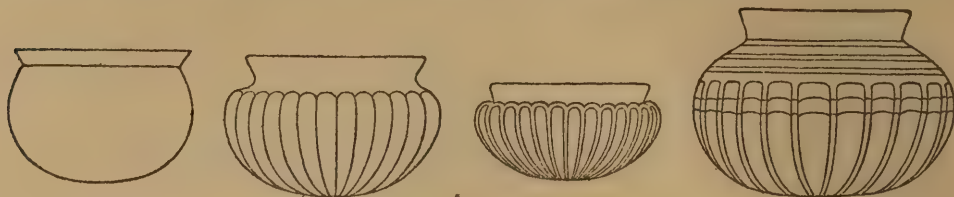


Fig. 5. Upright collar rims.—Sidonian, 1st century B.C. to 1st century A.D.

vessel with such lip, often characterized by an inner concentric foldover.—Fig. 6, *c-e*. **CORDED RIM LIP.** Viewed from the side and seen in profile, the lip rim is seen to consist of several tiers, often twisted, of rods produced by winding a glass rod around the rim, in the 3d and 4th centuries or even later vessels.—Fig. 6, *f*.



Fig. 6. Lip rim forms.—Early types, *a, b*—later types, *c, f*.

BRACELET RIM. A double ring around the rim began to appear in the middle of the 1st century, and consisted of the addition of a narrow band fused to the overfolded rim, like a glass bracelet with concave outer surface. At first inconspicuous, it soon was made quite large and noticeable, constituting a prominent characteristic of 2d century glass. Most globular sprinklers with inner diaphragm were made in that way. It was also used in wine bottles or toilet vessels with narrow and wide mouths.—Fig. 7, *a-d*.



Fig. 7. Lip collars.—Typical of 2d century A.D., *a, b, d*—of the 4th to 5th century A.D., *c*.

PINCHED OR TREFOIL LIP. The upper part of the neck was made funnel-shaped and slightly drawn out opposite the handle. The mouth was then pinched horizontally, near the spout end or in the center. When seen from above the opening appears as a small round hole in the middle of a trefoil leaf, the edges of which are sigmoid or curved inwardly except at the spout end.—Fig. 8.

ALMOND-SHAPED LIP. The lip was drawn out into an open spout, but not pinched.—Fig. 1, *b*.

ROD-RIM LIP. The edge of the mouth opening was lined by a round rod, generally with interior spiral threads. In mosaic glass vessels, and in those that consisted of different horizontal layers of lamellated glass, which were thereby held together



Fig. 8. Types of trefoil lip rims, single and double pinched.

and prevented from separating. The twisted and banded rod was used in 2d century beads.—Fig. 9, *a-d*.

PLAIN ROD-BAND RIM. A plain but heavy rod-band was fused around the rim and served as a lip. Coarsely made rod-band rims became common in the 4th century and continued in all poorer qualities of glass. Especially marked in Sassanian and late Coptic glass.—Fig. 9, *e, f*.

LOTUS RIM. In early Egyptian columnar balsam bottles the rim has the form of a half-closed lotus flower.—Fig. 9, *g*.

THE NECK

THE NECK OF THE GLASS VESSELS. The neck is absent or present, but as a rule occupies a prominent unit in the make-up of the vessel. At first the neck was small, moderate or insignificant, but even in early Egyptian times it attained conspicuous proportions. In Sidonian glass the neck was moderately high, probably on account of the technical difficulty connected with its making. Very long necks did not appear until glass-blowing had been reasonably perfected, in the end of the 1st century and later in the 2d century. Extremely long necks were favored by the later Sassanian glass-makers in the 4th to the 6th centuries, and after them by the Persian and Arabic makers. Wide funnel-shaped necks appeared to be favored in the 2d century and later. Necks with extravagant bulges and rings were common from the 4th century on.



Fig. 9. Egyptian mouth flanges, XVIIIth dynasty.—1st century B.C., *c, d*—6th to 7th centuries A.D., *e, f*.

CYLINDER NECKS. The neck is cylindrical throughout. At first it was made from a separate tube and attached to the body (Fig. 10, *a, b*). Later it was blown in one with the body. It gradually merged.—Fig. 10, *c-e*.

CYLINDER NECK WITH CONTRACTED BASE. Already common in early Sidonian series, but continued.—Fig. 10, *d*.

CYLINDER NECK WITH A SLIGHT BULGE. The bulge at the base or above the shoulder was due to the circumstance that the body was moulded and that the parts of the mould did not reach to the top of the neck. These moulded vessels were based on a geometrical system, which is readily analyzed if we begin the diagram at the marked center of the little bulge, often difficult to ascertain without careful examination, but always present in all such vases.—Fig. 10, *e*.

NECK WITH INNER DIAPHRAGM. The neck is always enlarged into a conspicuous bulge near the base, and immediately below the bulge is a contraction



Fig. 10. Various types of the neck.—Cylindrical—base contraction—base bulge—the last from 2d century A.D.

which sharply sets off the neck from the shoulder. Corresponding to this contraction in the interior of the neck is a diaphragm or disk with central minute opening. The smallness of the opening regulates the flow of the oil while the bulge above it catches the superfluous liquid and causes it to return. All these vases, known as sprinklers or *aryballoi*, are of small size, suitable for being held in the hand. Those with handles were used suspended by cords to the hands of the athletic bather or wrestler who oiled his body previous to the contest. The diaphragm in glass sprinklers began in the latter part of the 1st century and became common in the 2d century A.D.—Fig. 10, *f*, *g*.

JUNCTION OF NECK AND BODY. The junction varies considerably and often offers important chronological data.

A SPECIAL TUBE. In the earliest pad-glass and tube-blown vessels the neck consisted of a special tube. It is simply a section of a tube fused to the body.—Fig. 11, *a*.



Fig. 11. Types of junction between body and neck.—Horizontal—gradual—sunk—contracted or funnel-shaped.

DRAWN NECKS ABOVE A MOULD. In the Sidonian series in the time of Augustus the neck was produced by drawing after the bottle had been moulded, the junction where the drawing begins being marked by a ridge.—Fig. 11, *b*.

GRADUATED NECK. The neck is graduated by blowing from the body proper without break.—Fig. 11, *c*.

SUNK NECK. The base of the neck is rather deeply sunk below the upper horizontal of the body proper. Common in the 4th and 5th centuries.—Fig. 11, *d*.

GRADUALLY CONTRACTED. The neck is gradually contracted towards the body proper.—Fig. 11, *e*.

BULGE AT THE BASE. Already in the 2d century, or according to Kisa toward the end of the 1st century, it became the fashion to enlarge the neck at, or near, the base by interior blowing. The form of this bulge might prove important in dating vessels, but thus far significant details have not been noted with sufficient accuracy. Fig. 12.



Fig. 12. Neck base bulge.—1st and 2d centuries A.D., *a*, *b*—3d century A.D., *c*—4th to 5th century A.D., *d*, *e*, *f*.

DECORATION OF THE NECK. The decoration of the neck as well as the whole body was common since the XVIIIth dynasty. But the earliest blown vessels had plain necks. Threads wound around the neck made a style moderately used in the Sidonian period or series, and this became common in the 2d century A.D. Later the use of threads around the neck became extravagant, and in the 3d century A.D. we find the neck covered with thread waves, a decoration which also extended to the handles. In the latter part of that century we see the neck entirely obscured by wave decoration, connecting the neck rim and the shoulder, leaving the neck proper untouched. The collar decorating the neck was an addition in the 3d century A.D.—Fig. 13.

THE SHOULDER

THE SHOULDER OF THE VASE. The shoulder of the vase is that upper part of the body which connects with the neck and which is therefore more or less diago-



Fig. 13. Types of neck decorations.—3d and 4th centuries A.D., *a*, *b*—4th, *c*—2d, *d*, *e*—old Egyptian, *j*—2d to 3d, *f* to *i*.

nally slanting, sometimes quite horizontal, at other times even sunk. The mould decoration on Sidonian vases practically always included the shoulder, so that when measuring the vase or calculating its geometric system we must note the upper part

of the mould, slightly above the shoulder. In the early vessels the decorations generally included the shoulder both in moulded and dragged patterns of ornamentation. But in the later vases, from the beginning of the 2d century, the decorations generally stop short of the shoulder region. Exceptions however are found when the

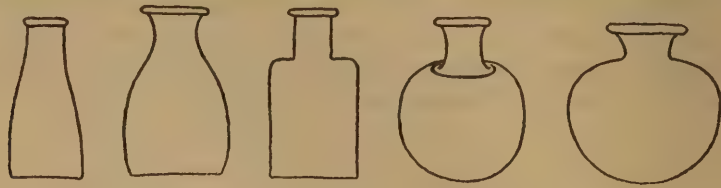


Fig. 14. Shoulder types.—Gradual—cylindrical—sunk—spherical.

wound threads on the neck continue over the shoulder downwards over the body of the vase. The plain shoulder is more effective. The shoulder generally served as the lower place of attachment for the handles. We can distinguish the continuous shoulder line as distinct from the well set-off line. The convex shoulder, the concave

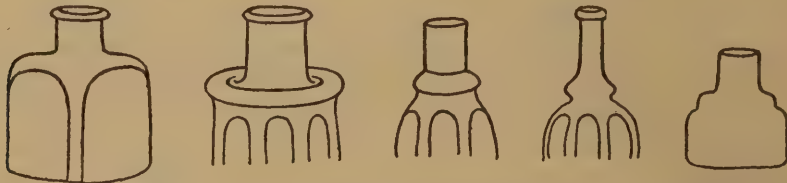


Fig. 15. Shoulder types.—1st century A.D. to 2d century A.D., *a*—3d century A.D., *b*, *c*, *d*—4th to 5th, *e*.

shoulder, the horizontal shoulder, the sunk shoulder are types which should be specially noted.—Figs. 14, 15, 16.

THE HANDLES

HANDLES. Handles appeared with the earliest glass vessels in imitation of the pottery handles, which latter had been in use since prehistoric times. The size and



Fig. 16. Neck and shoulder types.—5th to 6th century, *a*—1st century B.C. to 1st A.D., *b*—3d century A.D., *c*—3d to 4th centuries A.D., *d*, *e*.

form of the handles assist us at times in dating the vessels, but are not always an absolute guide. As a rule, it can be said that the smallest and simplest handles were the earliest and that handles gradually increased in size and evolved from simplicity and usefulness to complexity and extravagance. The greatest aberration was at-

tained in the 4th century, when the handles became numerous, ten or twelve on one jar. At the same time they were doubled vertically, besides being covered with finger catches in the form of flat, projecting knobs. At first the handles were smooth, but in the 1st and 2d centuries A.D. they were ribbed and covered with flat fins like a comb; at first they were rounded, but in the 2d century A.D. flat and broad handles also became fashionable; at first they ended where they touched the vessel proper, but in the 2d century A.D. they also were prolonged down the sides of the vessels; at first they were curved in simple fashion, but in the 1st century A.D. they became also angularly bent. Later they were sigmoid. In the 1st and 2d centuries they were sometimes given the form of small dolphins. In other words, handles at first made only for practical use became in time the principal decorative feature. **KNOB HANDLES.** The knob handles are strictly speaking only restrainers in



Fig. 17. Types of knob handles.

order to keep the hands from slipping. The form is that of a small, compact, round, flattened or otherwise formed lump of glass placed on or below the shoulder. It is common on the Egyptian early alabastrons. It soon developed into the next following type.—Fig. 17, *a, b*.

EAR HANDLES. The ear is a small curved rod, often not larger than the knob, but instead of being made of a small lump of glass it was made of a cut of a rod bent

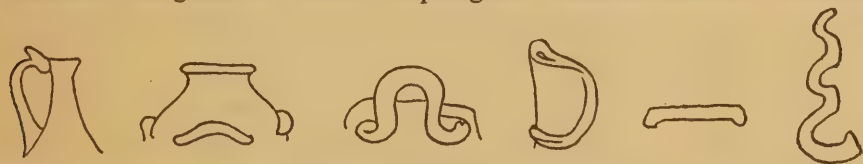


Fig. 18. Loop and arch handles.—Common, *a*—1st, *b*—1st to 2d, *c*—3d, *d*—4th century A.D., *e, f*.

in semicircular form, placed on or below the shoulder, or, when larger, below the lip on the neck. Sometimes it was curved in different directions and became sigmoid and extended from top of neck to the shoulder. Common in the XVIIIth and XIXth dynasties and later.—Fig. 17, *c, d*.

DOLPHIN HANDLES. The sigmoid ear handle was made thicker and heavier and shaped as a dolphin, head downwards, the loop representing the eye. Common in the so-called dolphin vases of the 1st and 2d centuries A.D., but not always well defined.—Fig. 17, *e-g*.

LOOP HANDLES. The handle forms a loop or arch between the neck, or mouth, and the body proper. Fig. 18, *a*.

ARCH HANDLES. These have both ends attached to the body of the vessel and

are either horizontal or perpendicular. Both kinds are often found on water jars.—Fig. 18.

ROUND LOOP HANDLES. The handle was made of a round glass rod, the upper end of which generally, but not always, gripped the lip and ended on the shoulder. The form was either nearly straight, as on some amphoræ; curved evenly and circularly; sigmoid; or angularly bent, in acute, in right or in obtuse angles.—Fig. 19.



Fig. 19. Loop handles of round rods, earliest Roman types.

FLAT-RIBBED HANDLES. The handle was made of three or more parallel rods, widening at the base, each rod projecting in a prong or tip, generally placed between lip and shoulder. This type is called by Kisa “celery” handles because they resemble the lower base part of a celery leaf with its projecting fibers torn loose from the stalk.—Fig. 20, *a-c*.



Fig. 20. Flat composite handles.—2d to 4th century, *a*—“celery” handles, *b*, *c*—2d, *d*—1st, *e*—2d, *f*, *g*.

MORE OR LESS SMOOTH, FLAT HANDLES. Made of flattened rods, often with raised margins. Began to appear in the 1st century A.D., becoming favorites in the 2d century A.D.—Fig. 20, *d-f*.

FLAT HANDLES WITH HEAVY EDGES. The handle is band-like with heavier edges which spread in large drops or claws where they join the body of the vessel. 1st and 2d centuries.—Fig. 20, *g*.

ZIGZAGGED HANDLES. Beginning with the 2d century A.D. the round loop handles are often zigzagged. The zigzagging may be merely a waving of the rod, but in the 2d century A.D. it is often also accompanied by a pinching of the small knees, which frequently continues down the body of the vase as a special decoration. Later, in the 4th and 5th centuries A.D., the zigzagged loops stand away from the body in a most bizarre and unæsthetic manner.—Fig. 21, *a-j*.

CHAIN HANDLES. Two separate rods were bent and rebent to simulate the loops of a chain. Sometimes the loops of the chain were actually free to move. These types were fashionable in the 3d and 4th centuries.—Fig. 21, *k-n*.



Plate 1. Moulded and carved head in two tints of blue glass. Egypt, XVIIIth dynasty.
Louvre Museum.—See page 120.



Plate 2. Core-wound glass vessels, Egypt, XVIIIth dynasty. Freer Collection, National Museum, Washington, D. C.—*See pages 119, 120.*

CORD HANDLES. Made of two twisted rods of glass, like the stirring rods of the early Roman empire. Comparatively rare.—Fig. 21, *o, p*.

PLATE HANDLES. Flat, horizontal handles at each opposite end of the rim. The form varies, sometimes like a wide crescent, sometimes like a projecting deltoid tongue. Favorites in the 1st and 2d centuries A.D. Glass, metal and wood. Found with coins from time of Tiberius to Hadrian. On pottery, dated by Koenen, Pl. XVI, 18, 27. Oswald and Pryce, Pl. LVII.—Fig. 22, *a-d*.

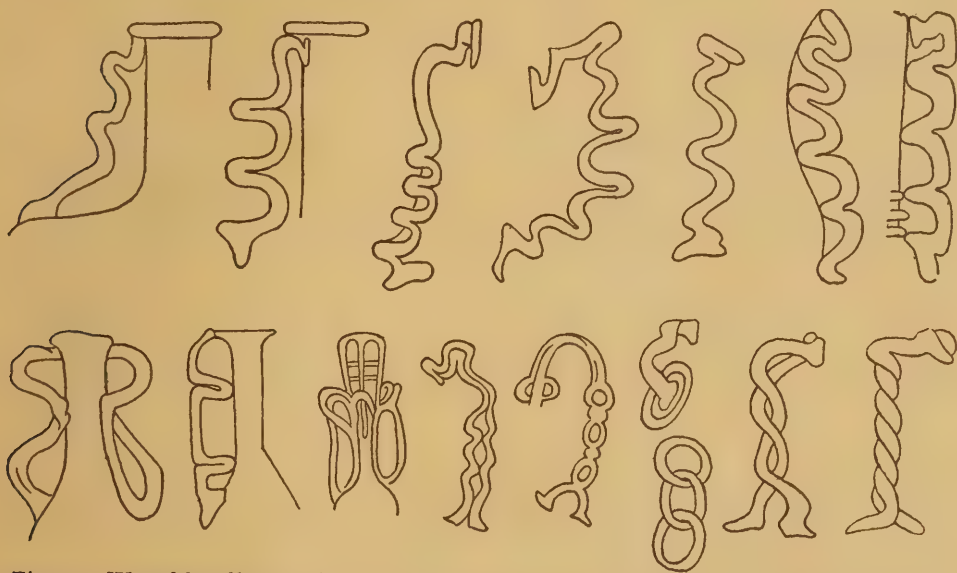


Fig. 21. Waved handles.—4th, *a*—3d, *b, d, e*—2d, *c*—4th, *f, g*—4th, *h*—3d and 4th, *i, j*—3d, *k, l*—4th, *m, n*—2d to 3d, *o, p*.

RING HANDLES WITH FLAT GUARD. The ring handle consisted of a more or less perfect ring of glass attached to the neck below the lip rim, and generally furnished with an upper and lower flat guard or thumb rest. Such handles were common on cups of pottery, silver and glass in the Augustan era, but disappeared



Fig. 22. Plate and tray handles.—1st B.C. to 1st A.D., *a, b*—2d, *c, d*.

after the middle of the 1st century. They are characteristic of the green glazed Syrian pottery, of the Augustus and Tiberius cups and of the Varpelev cup in Copenhagen. 1st century B.C. to 1st A.D.—Fig. 23.

HORIZONTAL HANDLES. Horizontal handles were used especially on water

jugs and jars, often alternating with perpendicular ones. They occur always in pairs, one for each hand, opposite each other. They can be considered as developed knob handles, and are of many sizes, sometimes arranged in horizontal rows on the same vase.—Fig. 24, *a-e*.

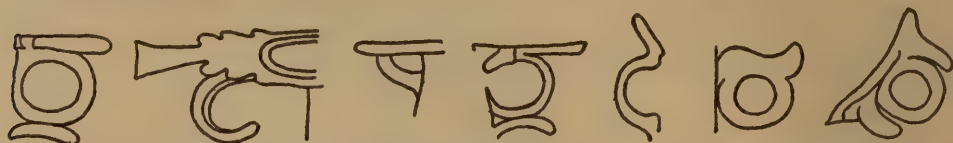


Fig. 23. "Finger ring" handles.—Augustan era, *a* to *d*—2d, *e*—1st A.D., *f*, *g*.

BASKET HANDLES. Generally of the 3d and 4th centuries A.D., imitating the handles of baskets. Fig. 24, *i*, was made as a curiosity and in token of extravagance rather, more than for actual use. Paired upright standing parallel handles are common on the cinerary urns, 1st to 3d centuries A.D.—Fig. 24, *f-j*.



Fig. 24. Horizontal and basket handles.—Common, *a*, *b*—Augustan, *c*—3d, *d*—1st B.C. to 1st A.D., *e*—1st to 3d, *f*—3d, *g*—2d to 3d, *h*—4th, *i*—2d, *j*.

THE UPPER ENDINGS OF THE HANDLES. At first the handles were attached to the mouth rim without special grip. Later they were made to bend over the rim so as to grip it firmly. Later a double or triple knee bend at the rim became common, especially in the 3d century. In the 2d and 3d centuries the grip at the rim was made to stand out at an acute angle some distance above the rim. Kisa, 47.—Fig. 25.

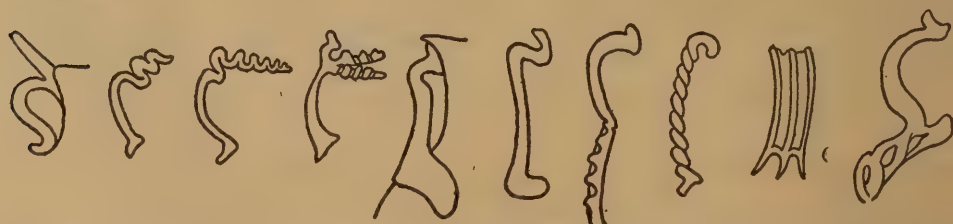


Fig. 25. Types of the upper and lower endings of handles.—2d, *a*, *b*—3d to 4th, *c*, *d*—4th, *e*, *f*—2d, *g*—1st, *h*—3d, *i*—3d to 4th, *j*.

LOWER ENDINGS OF HANDLES. Generally the handle ends on the shoulder or body of the vase by means of a spread-out shield. In the 2d to 4th centuries occurred the "celery" handles, made of numerous round or flattened rods, each ending in a single sharp point. Sometimes the flat ending was enormously enlarged,

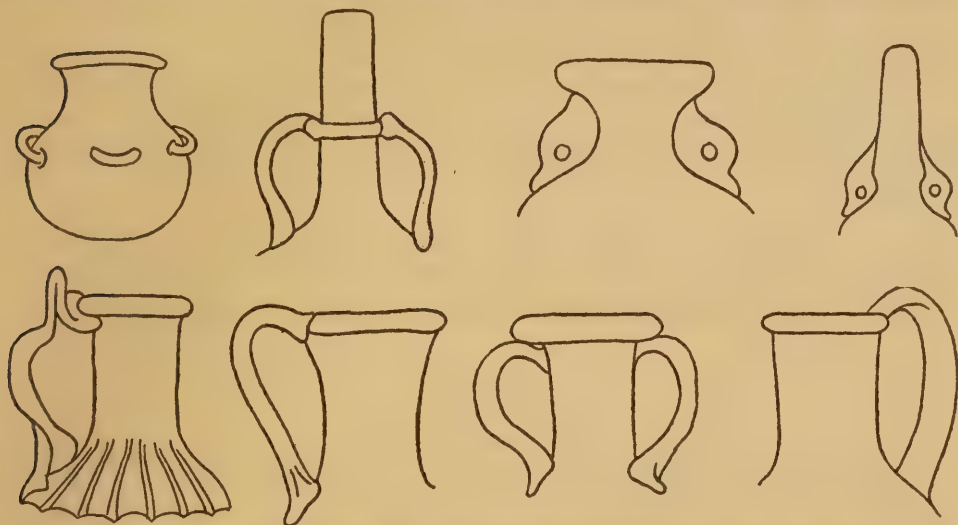


Fig. 26. Methods of attaching the handles.—Common, *a*—2d to 3d, *b*—1st B.C. to 3d A.D., *c, d*—1st A.D., *e, f, g, h*.

forming a conspicuous shield. Sometimes again the rod was folded or waved and pinched into a continuous wave and fins, continued downwards below the bulge of the vase, even to its foot.—Fig. 25, *e-j*.

PLACE OF ATTACHMENT OF THE HANDLES. The early knob handles were attached to or below the shoulder, and later between the neck and the shoulder. In the 3d century A.D. the upper part of the handle often embraced the center of the neck. In the 4th century the basket handles rose, as a basket grip, in an arch above the mouth, or were attached to the lip rim, shoulder and neck at the same time.—Fig. 26, *a-b; 24, i, j*.



Fig. 27. Loop handles for suspending ring decorations and pendants.—4th century A.D.

RINGS AND EYELETS. Bronze and glass eyelets or bronze rings are sometimes found hung in glass handles. The earliest seen by the writer date from A.D. 140, two such vases being figured in *Notizie degli Scavi*, 1922, p. 230. In one vase we see about fifty eye-keys, in another about fourteen. Loose keys of glass are quite common in the 4th century Syrian tombs.—Fig. 27, *a-d*.

THE FOOT OF THE VASES

The importance of the form and proportions of the foot can not be overestimated, as they sometimes furnish us with the means of determining the date. In the foot we find two main types or classes. It may either be in one with the body proper, or it may have been added after the vase was blown. Both types were used contemporaneously, but each was more or less favored at different periods. The under side of the foot should be examined for stamp marks, letters or decorations. It should also be noted if the foot is flat or concave on the under surface or if the stem above the foot projects upwards into the bowl of the vase. The latter type is Arabic. —Fig. 28, *a-f*.



Fig. 28. Types of foot-base.—Syrio-Roman, *a*, *d*—Roman, *e*—Arabic or Venetian, *f*.

THE BASE

The base is either an integral part of the body or has been added after the vessel was made. When an integral part, it is either flat, rounded or pointed. When not flat it is used with a tripod or stand, or placed in soft sand. When flat the base is often decorated with a name, a figure or with stars and spheres. The name and

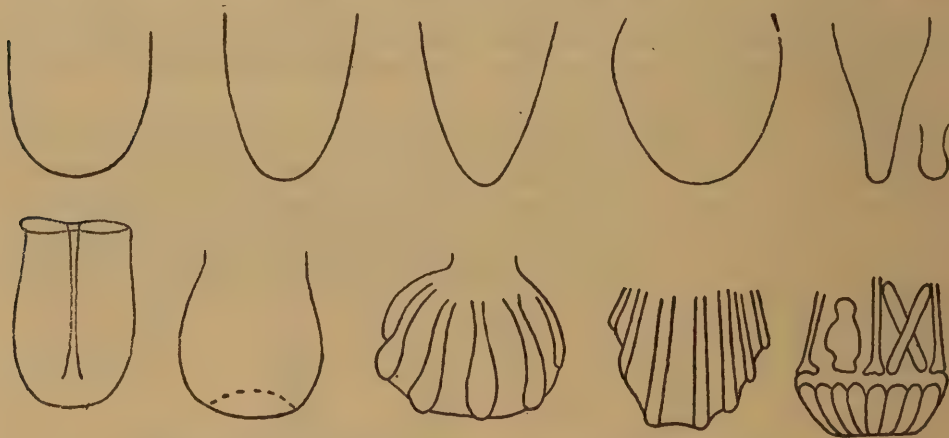


Fig. 29. Base types.—Common types, *a* to *e*—4th, *f*—1st, *h*, *i*, *k*.

the figure, generally Mercury or some other deity, were common in the 1st and early 2d centuries A.D. The stars and spheres were used in the 4th and 5th. It is of great importance for proper classification that such decorations should be given heed. Sometimes in the 1st century the base was slightly contracted, but still flat. —Figs. 29, 30, 31.

In the beginning the applied foot was solid and frequently fashioned on a potter's

wheel. This was the practice especially in the 1st century B.C. to the 1st century A.D., when the great majority of applied foot disks were made smooth on the under surface by grinding. The solidity made them heavy in proportion to their size, which was always small in proportion to the body, as we find it on the Arretine pottery of

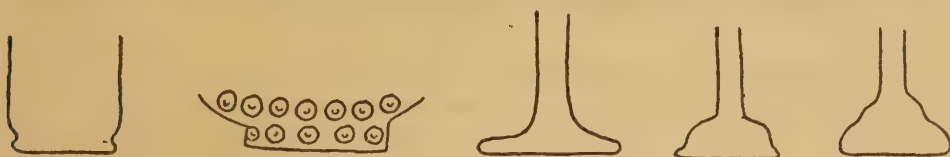


Fig. 30. Types of bases.—1st to 3d century A.D.

the Augustan and Tiberian era. In the 2d and 3d centuries the hollow concaved or inverted funnel-shaped foot was used almost exclusively together with thin solid disks or applied rings of rod glass. Of the applied foot stand we therefore have several characteristic classes.

THE PLAIN DISK. The plain disk cut out of a sheet of pad-glass was added to a tube bottle which had never been enlarged by blowing. Such bottles consisted of four distinct parts, made separately and joined by fusing: tube neck, disk shoulder,

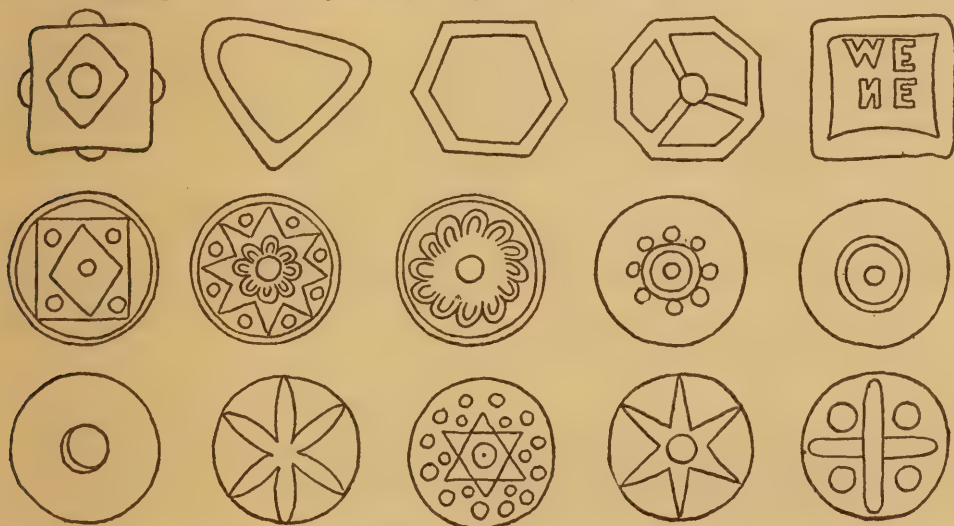


Fig. 31. Bottom forms of moulded patterns.—2d, *a*—5th, *b*—1st to 4th, *c*—1st, *d*—4th to 5th, *e* to *o*. The last two rows are Christian symbols: Old Testament, Star of Bethlehem, patens and hosts, Vision of Constantine.

tube body, plate disk-base. Hardly seen or made after the early Ptolemies. But plain circular disks serving as a foot and applied to the base of the vessel were used after that time.—Fig. 32, *a*, *b*.

THE PLAIN ROD RING. A plain rod ring, either round, as originally made, or flattened, was added to the base of many vases already in Sidonian times, and especially when the base as well as the rest was composed of stratified, mosaic or

ivory paste glass. The rod ring runs along the edge of the base, leaving the center of the base free.—Fig. 32, *c*.

CRENULATE ROD RING. A waved or pinched rod ring added as a foot ring to vases appeared in the end of the 1st century and was sporadically favored in the 2d and 3d centuries as well as later. On beakers and sprinklers, 2d century A.D.—Fig. 32, *d*.

CRENULATE BASE THROUGH RIBS. A resemblance of crenulation was also produced by projecting ribs made of perpendicular rods.—Fig. 32, *e*.

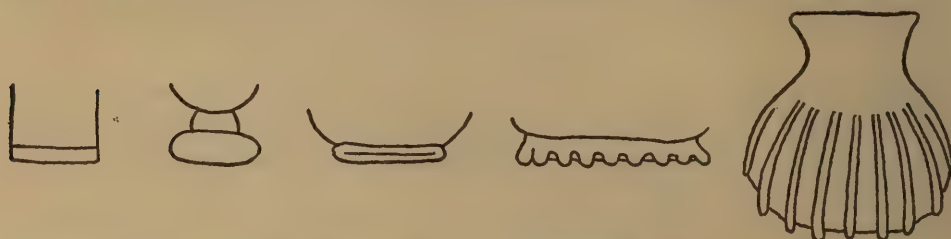


Fig. 32. Main types of vase foot.—Common, *a*—4th, *b*—common, *c*—2d to 3d and later, *d*—3d A.D., *e*.

CONCAVED DISK BASE. The foot base is sometimes flat, but more generally concaved underneath. The cavity is sometimes connected with the rod or pontil mark but sometimes simply pressed in. In some instances in Arabic glass it rises into the cavity of the bowl part of the vessel. This style is of the 12th century A.D.



Fig. 33. Types of stem and foot units.—1st to 2d, *a*—1st, *b*—3d, *c*, *d*—3d to 4th, *e*—12th to 13th, Arabic, *f*—1st to 2d, *g*—2d, *h*.

and was previously incorrectly dated to the 3d century A.D. In early Roman times, including the 1st century B.C. to the 1st A.D., the foot was solid, or the cavity of the foot was small. With the 2d century and onward the cavity increased



Fig. 34. 3d, *a*—1st, *b*—4th, *d*—1st to 2d, *e*, *f*—3d to 4th, *g*.

in size, and the Christian chalice in the time of Constantine and the early Byzantine period possessed a funnel-shaped foot, generally of extravagant size and height.—Fig. 33, *a-b*; Fig. 34.

TYPES OF DECORATIONS

APPLIED SURFACE DECORATIONS. Threads, rods, fragments of glass are applied to the surface and more or less pressed in the soft matrix. Sometimes the threads fall out and give the erroneous idea that the grooves were excavated in the matrix. From the XVIIIth dynasty onward.

PAINTED SURFACE DECORATIONS. Enamel or ordinary earth colors. From the Ptolemies. The stratified eyes of beads and glass vessels have sometimes been incorrectly described as enameled. So too have the applied threads and rods. Italian dealers and archæologists are especially prone to this error; they call the threads "smaltato." Compare Kisa, pp. 146-160.

CELL DECORATIONS. Excavations of cell-like cavities were filled at first with fitted glass pieces, later with enameled powder, which was fused to solidity. The fitted cells and cut glass date from the XVIIIth dynasty; the enameled powder from the Ptolemies.

IMBEDDED DECORATIONS. Threads and rods of glass were made to dissolve in the matrix or on its surface. 1st and 2d centuries A.D. They sometimes came to the surface naturally, but in the majority of cases they were made visible by grinding the matrix.

MIXED MATRIX MOSAICS OR "BRESCIA." Fragments of glass were dropped into fused matrix, used for pad-glass. The surfaces of the fragments adhere but slightly to each other. From XVIIIth dynasty.

STRATIFIED RODS. Pads were made of rods of glass and twisted into beads or tubes. 1st century B.C. Venetians revived the art.

STRATIFIED LAYERS. Sheets of glass of different colors were fused and cut in strips, in which the layers were exposed. Both beads and vessels were made from them. 2d century B.C. to 1st A.D.

COLUMNAR MOSAIC BY RODS. Millefiore glass. Different colored glass rods were placed parallel and fused. Their cross sections produced the decorations.

STRATIFIED EYE DECORATIONS. These were made by applying a large globule of glass to the surface of a bead or vessel, and after pressing it into the soft matrix, applying another globule of smaller size. When flattened and polished, the unit would appear as an eye. From the XVIIIth dynasty to the later Ptolemies, when it was replaced by the columnar rod technic.

SCATTERED SURFACE FRAGMENTS. Granules of glass were scattered over the semifused surface and rolled. Common in the 4th century A.D.

GUTTA DECORATIONS. Soft drops of glass or granules of glass were applied to the surface and fused sufficiently to appear like drops on the surface. They became common in the 1st to 2d centuries A.D.

DISKS. Disks of glass, often with moulded decorations, were applied to the surface of a glass vessel and caused to adhere by fusing. The technic came from pottery and metal work. Most common in the 1st to 2d centuries A.D., being revived by the Sassanians and becoming once more common in the 4th century A.D.

CAMEO DECORATIONS. The glass matrix was made of two layers of differently colored glass. The upper layer was partly cut away in patterns.

INCRUSTATIONS OF NATURAL OBJECTS or imitations. Natural shells or imitations of these and similar objects were applied to the surface in the degraded art of the middle Roman empire.

BARBOTINE AND SLIP ON GLASS. The names barbotine and slip are given to a liquid paste made of oils, water and powdered glass or earth colors, applied to the surface of the glass in liquid form and later fused and hardened by heat. It was formed both before and after heating, in designs of vine bunches, leaves, tendrils,

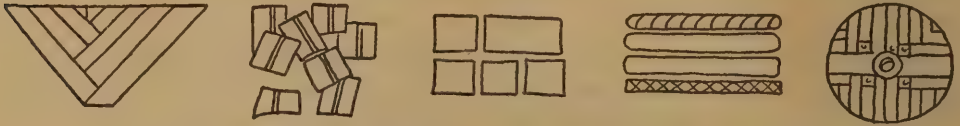


Fig. 35. Types of lamellated decorations on mosaic glass, Augustan era.

stems, still-life decorations, as well as human and animal figures. The finest specimens date from the 1st century A.D.; the greatest number and least perfect from the end of the 3d to the middle of the 4th century. The technic did not adapt itself well to glass, though a few very fine specimens are known (Kisa, Figs. 112, 131, 136). Especially common in the 2d and the 3d centuries A.D. on pottery.

LAMELLATED PATTERNS. Made of flattened rods, like strips of glass, often alternating with thin square or circular disks. The pattern was arranged on a thin sheet of glass, generally of bluish tint and transparent, secured by gum or mastix. It was then fused to adherence by heat. The bands are either parallel or scattered, and as the patterns on the two sides of the glass never match in position, parts covered in this way, when held up to the light, appear darker than the rest; or when

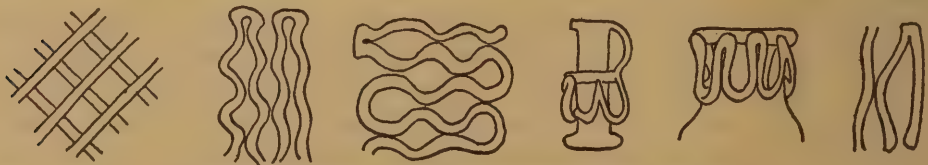


Fig. 36. Applied wave threads, end of 2d to 4th A.D.

blue overlaps yellow the streak becomes green. According to the arrangement we have parallel bands, arranged to form a cross or segment; fragmentary and scattered patterns, as in the famous Vatican crater cup; tessellate and checkerboard patterns; or the bands alternate with trina rods with interior spirals. 1st century B.C. to 1st century A.D.—Fig. 35, *a-e*.

WAVE AND CROSSING RODS. The pattern is produced by rods and threads of glass in various ways: (a) Net work, in which the parallel rods cross at certain angles, producing square or lozenge-shaped fields. (b) Perpendicular or horizontal alternating wavy rods, so arranged that the crests meet crests and the vales meet



Plate 3. Core-wound glass, XVIIIth and XIXth dynasties. Egypt, I, columnar balsam flasks. Mrs. W. H. Moore Collection, *c.* All the rest from the Freer Collection, National Museum, Washington, D. C.—*See page 121.*



Plate 4. Core-wound glass, Egypt. Amphorisks, pitcher, about 8th century B.C. Alabastrons and pitcher, 6th to 3d century B.C. Mrs. W. H. Moore Collection.—*See page 122.*

the vales. Common in the 3d and 4th centuries A.D. A similar arrangement is found in the diatretum glass, but in this glass the rods were partly separated from the matrix by cutting. (c) In some 4th century vessels the waves were strung between shoulder and lip, leaving the space between them and the vase free. Mostly of the 4th century A.D.—Fig. 36, *a-f*.

DRAGGED PATTERNS. Already practiced under the XVIIIth dynasty (1400 B.C.) and continued to our day. Used by glass-makers as well as by cake and candy makers. Threads and rods of glass were placed on or wound around a vessel, and while yet soft from heat, the arrangement or parallelism was disturbed by dragging upwards and downwards with a metal point. According to the manner of dragging we can distinguish the following patterns: (a) Waves when the threads are but slightly disturbed. (b) Zigzags when the crests are pointed. (c) Arcades when the crests are rounded like arches. (d) Garlands, when the upper crests are angular and the lower vales round like hanging garlands. (e) Plumate, when the threads are thin and close and the displacement is acute, like the rays in a plume. (f) Helicoid, when the ends of the drag curl up, like the end of a helix shell. (g) Scattered foliate, when the strokes were diagonal and irregular, as on the 5th and 6th century A.D. glass. (h) Foliolate, when the leaves are flat and wide, like the leaflets on a composite leaf.—Fig. 37, *a-k*.



Fig. 37. Dragged wave decorations.—Wave, zigzag, arcades, garlands, plumate, helicoid.
Second line.—Scattered, foliate, tree of life or herringbone, corded, parallel, closed zigzags.

OVERLAID AND FOLDED THREADS. Superficially resembles stratified glass but was made of threads confined to the surface of the glass matrix. We can separate the following types: (a) Single fold when a strip covered with one or more glass threads is bent into a loop. (b) Waves, when the strip is waved. (c) Double fold. (d) Herringbone pattern, when the two strips on which the strips run in different directions, are joined. (e) Diamond loops, when two waves meet to form an area. (f) Ear loops, when the meeting loops are almost closed. (g) Lunate, when two loops are joined with their crests instead of with their openings. In all these patterns the lines consist of surface threads upon a strip bent upon itself.—Fig. 38, *a-g*.

SERPENTINE DECORATIONS. The serpentine decoration on antique glasses was practiced especially in the Rhine valley and is rarely found on Syrian glass. The technic consisted of applied threads of glass, sometimes left in the round, some-

times flattened, and sometimes furrowed by means of a creased roller or stamp. The earliest application consisted of opaque white threads. Later, in the 5th to 6th centuries, green, yellow and violet threads came to be preferred. In the 2d and 3d centuries the serpents are practically always horizontal with perpendicular or diagonal folds. In the 4th century the main direction of the body is perpendicular, with the folds horizontal.



Fig. 38. Overlaid and folded thread patterns, mostly 3d to 4th A.D.

The earliest threads, that is, those found in the early part of the 2d century, imitate the vine branches of the glazed pottery of that period. But in the 2d to 3d centuries the horizontal serpents are furnished with enormous crudely made open jaws and heads. In the 4th century upright serpents, the jaws are not open and the head is merely emphasized by a swelling or lump, possibly by a circular disk.

In ancient times serpents were sacred and represented the household gods. They were sacred symbols which indicated that the place should be respected, and not be defaced or polluted. Persius, *Sat.* I, 13.)—Fig. 39, *a-e*.

In Brittany persons carried snakes with them in order to neutralize the power of a witch or sorcerer, to prevent being hypnotized and to bring it about that all

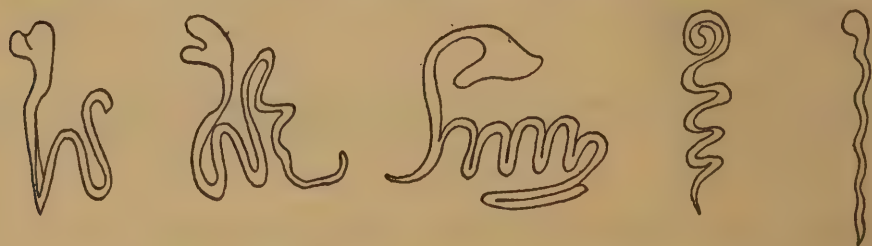


Fig. 39. Applied threads, serpent designs, 2d to 4th A.D.

objects would appear to them as they were (Lewis Spence, "Occult Brittany," *Occult Review*, May 19, 1924, p. 277). The many serpent decorations found on German glass would be better explained by this theory than the one generally accepted, that serpents symbolized wisdom, in the north of Europe as well as in the south and in the Orient. Serpent threads were also common on beads, favored, though probably not made, in the north of Europe, during the 6th and 7th centuries A.D. A flask with bulging body, one handle decorated with yellow and blue serpent threads, was found with coins of Julia Domna, Hadrian, the Antonines and Julia Maesa. (Otto Jahn, *Bonner Jahrb.*, 1863, 34.)

WAVE BAND BETWEEN BORDER LINES. The decoration consists of a continued wave or glass threads bordered on top and base by a horizontal guard line of glass. It is generally applied on the neck and in a manner to stand out prominently. 3d to 4th century A.D.—Fig. 40, *a-g*.

INCRUSTATIONS. Incrustations are decorations applied to the surface of the glass in the form of granules, drops and disks. In classic times the granules were

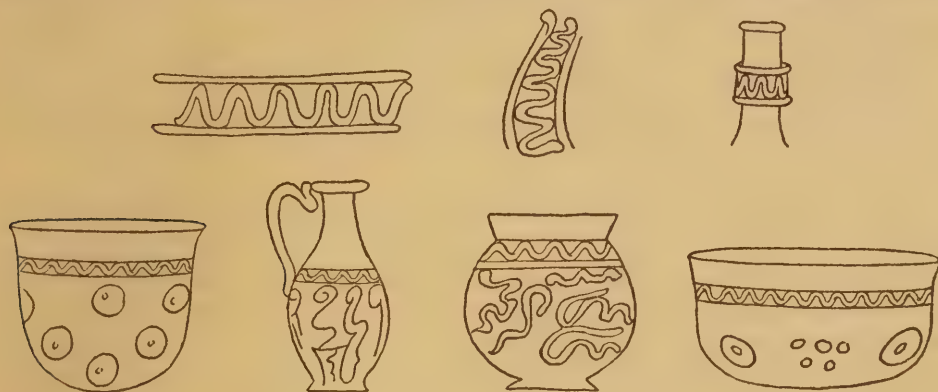


Fig. 40. Waves between borderlines, 3d and 4th centuries A.D.

rolled in, but later, after the 4th century A.D., and especially under the Sassanians and the Arabs, the drops were left as bosses on the surface. The types illustrated in the text figures are those most prevalent.

GUTTA DROPS AND GRANULES. The granules were fused in the surface and became rounded as to outline. The colors are blue, brick red, ochre yellow, etc., never very brilliant until the 4th century.



Fig. 41. Gutta drop incrustations, disks.—1st to 2d, *a, b*—Venetian, *c*—hour-glass, *d*—disks, Augustan, *e, f*—4th to 5th A.D., *g*.

APPLIED MOSAIC DISKS. Sections of mosaic rods were applied on the glass surface, fused and often rolled in the matrix.—Fig. 41, *e, f*. In Sassanian times glass pads having the form of sheep or cattle hides were a favorite decoration.—Fig. 41, *g*.

TEAR DROPS AND SCALES. Two drops connected with a slender body and applied to the surface are known as tears. Those crenated or waved on the crest are called “elephant trunks” by Kisa. Pointed drops were common. The large drops with a point are called pine scales; the thin compressed ones are called fins.—Fig. 42.

DROPS ARRANGED AS ROSETTES. A larger central drop was surrounded by some smaller ones in a circlet, or many small ones were arranged as grape clusters.

The units were circular or oval. Common in the 3d and 4th centuries A.D., but revived with brighter colors by the Arabs in the 12th to 14th centuries A.D. and later.—Fig. 43.

PETALS AND BUDS. Sections having the form of petals, or hearts, triangles, lotus buds or almonds, and small disks. Kisa dates the earliest to the 1st century



Fig. 42. Applied drop forms, tears, pine scales, fins, star-beads.—3d to 4th—Venetian 14th to 15th century A.D., star-beads.

A.D., which is doubtful. The lotus buds (Fig. 44, *c, d*) are certainly not earlier than the 1st century A.D.

APPLIED DISKS WITH FIGURES. Disks with Medusa heads were in use as surface decorations from the 1st century B.C. and became common both on glass and pottery during the 1st and 2d centuries A.D. In the 4th and 5th centuries A.D.



Fig. 43. Drops arranged as rosettes and grape bunches.—3d, *a*—3d to 4th century A.D., *b* to *h*.

the Sassanians decorated their glass with disks containing moulded birds, Pegasus, lions and heroes. The Christians stamped the image of St. George on theirs.—Fig. 45.

ANIMAL FIGURES WITHOUT DISKS. The application of small-formed fishes and shells to glass vessels became common in the 3d and 4th centuries. Some of them are crude but life-like.—Fig. 46.



Fig. 44. Applied petals, lotus buds, disks.—1st to 4th century A.D., generally late.

ENAMEL DECORATIONS. For the sake of convenience we can distinguish the following types of enamel used in antique glass and kindred objects, all seemingly derived and developed from the inlay with colored glass:

BRUSH ENAMEL. Pulverized glass was mixed with some adhesive and applied by painting on glass vessels which were reheated, whereby the enamel adhered to the surface. Oldest specimens examined by the author date from the time of Augustus, and consisted of representations of laurel wreaths and simple decorations.

PIT ENAMEL. The powdered glass, after mixing with adhesive, was placed in a

previously excavated depression or cavity, such cavities being in time arranged to form a decoration. Kisa (pp. 145, 158 and 507) dates this technic to the 2d century A.D. in Britain and Gaul, while Maspero and others claim that enamel was used already in the XVIIIth dynasty. Semper and Virchow date the pit enamel to 1000 B.C. (Virchow, *Arch. Congress in Breslau*, 1884), but the earliest so far recog-



Fig. 45. Applied disks with figures.—Augustan to 3d, *a, c*—4th to 6th century A.D.—*b, d, e, f, g*—Sassanian, and Christian.

nized with certainty is among the decorations of the Meroe treasure, now in the Antiquarium of Munich (Christ und Lauth, 1870, p. 40) as of the 3d century B.C. In Greece the earliest known enamel goes back to the 4th century B.C., also in the Munich Antiquarium (Christ, *Führer*, p. 39).

THE CELL TYPE of enamel is the most common, cells being built up of threads of metal or strips of metal sheets, filled with enamel paste and fused. The date is uncertain, as most investigators have mistaken inlay for enamel, but it seems probable that such work was well known in the 4th to 6th centuries A.D.

FURROW ENAMEL. This name was introduced by O. Tischler (Kurtz, *Abr. d. Geschichte des Enamels*, 1886) for furrows filled with colored glass, dated to the Hallstadt period, early first millennium B.C. This technic was, however, produced by glass threads. It has also been assumed, but erroneously, that the glass threads found on beads were placed in excavated furrows, instead of being simply pressed into the glass matrix.

EARTH COLORS SURROUNDED BY BLACK OR ENGRAVED LINES. Most of the specimens decorated with painted designs in earth colors are surrounded or edged by black lines. This was done to emphasize the design and to prevent the spreading of the colors. The finest specimens of this technic come from the Danish



Fig. 46. Applied animal types.—4th, *a* to *d*—2d to 3d century A.D., *e* to *g*.

tomb finds. The vessels are in the form of small cylindrical cups, scyphi, and represent scenes of the chase, hounds, lions, gladiators, birds and even letters, all designed with spirit and art, full of movement. The borders are often lined with circular dots in bands. Even names were painted, and the large vacant places were filled by heart-shaped petals. Such petals were used in Sassanian times and continued in use to the time of Chosroes II, in the 7th century A.D., or later; they were also in use at least as early as the 2d century A.D. Some are Christian, others Sassanian.—Pls. 103, 104.

Another series of painted designs represents amorines, grapes, birds, ivy wreaths, leaves with tendrils, stars, amorines fighting storks, pagan deities, and arches, grape vine trellises and birds, the latter from Khamissa in Algiers, like the cameo design on the Naples amphora. Some of the most important of these vessels are reproduced by Kisa in *Das Glas*, Figs. 338-353.

It seems probable that the art continued in use down to the Byzantine period when it was applied to metal work. Later it was perfected by the Arabs, especially in the 9th and 13th centuries.

GOLD ENAMEL PAINTING. In conjunction with ordinary enamels, gold, pulverized and mixed with glass powder, seems to have been used as early as the 1st century B.C. Of this type are the gold stars on the Sacro Catino of Genoa, and probably the hunting scene on the plate in the Terme Museum in Rome, the latter dated to the 1st or 2d century A.D. Various gold-glass specimens of the 4th century are claimed by Kisa to have been decorated in this technic, which is, however, quite distinct from the gold-glass graffito. Both are, however, sometimes used together.

PRESERVATION OF THE PAINT. In order to preserve the paint it seems that the surface was covered with some glaze or varnish. The quality of this varnish is not known, but as it was not soluble in water we might assume that it partook of the quality of fir balsams, which when dried are impervious to water.

MOULDED DECORATIONS. The Sidonian glass is generally moulded and covered with decorations of columns, arches and sacred vessels. In the 1st century gladiatorial figures began to appear alternating with laurel wreaths and objects of the arena. This technic of moulding continued and was once more revived in earnest in the 4th century A.D. both on Christian and pagan vessels.

DESIGNS BY MEANS OF STAMPS. The early mouldings were always in relief. Later, when this art became difficult, the use of stamps was introduced. In these the design was raised, so that it appeared concaved on the matrix. This technic was common in the 4th century A.D. At this time the stamps were often designed with both convex and concave figures which on that account are confusing and difficult to decipher, especially those on the sacred Jewish and Christian glass of the Constantinean period.

BUCKLED DECORATIONS. Already in the 1st century A.D., but especially in the 2d, the sides of flasks were pressed in, the decoration having the form of a sunken oval. This decoration was repeated and yet in use in the 4th and 5th centuries A.D. and never went out of fashion.

GROUND SURFACES AND DECORATIONS. The grinding of glass dates from the old Egyptians and was made by emerald powder and corundum. It was much in use under the Ptolemies, when all vessels were made of pad-glass, and were given their final appearance by grinding on a wheel. Until glass-blowing was invented, all bases of vessels were made flat by grinding. The use of grinding continued, and in the 4th century A.D. we find that the heavy reliquaries of solid glass were ground to shape.

Ground decorations of circular disks, oval disks, and plain concaved lines began

in the 1st century A.D. but became a favorite technic in the 2d century A.D. It never went out of fashion. Many of the finest ground-glass beakers and glass flasks belong to the 3d century A.D. It is said by Kisa and others that all the diatreta vessels belong to the 3d and 4th centuries A.D.

HONEYCOMB CELLS. Decorations with ground-out outlines of hexagonal honeycomb cells, alternating with diagonal lines and ovals in rows and parallel lines or bands, were made in Syria, although some vases have been found in Roman tombs in Germany. The only dated vessel was found with coins of Divus Maximianus Augustus, Roman emperor 286-305, d. 310 A.D. (F. Wieser, *Röm. Gläser*, Pls. II, III. *Bonner Jabrb.*, 1876, p. 64-87, Pl. III, 3.)

ROD DECORATIONS

DECORATIONS WITH RODS. In the XVIIIth dynasty it became the habit to confine and strengthen the rims and lips of vessels by means of simple or spirally wound rods. Later the whole vessel was made of rods, especially in the time of Augustus. But the Venetians developed the technic and produced marvels of flat dishes entirely composed of rods. For such purpose both plain and filled rods were used. The use of rods in the 2d century led, it would seem, to the invention of stratified glass. The technic of these types is as follows:

VESSELS MADE OF PLAIN RODS. A pad was first made of rods, placed side by side on a flat surface. The pad was fused to adherence and then rolled up on itself to form a tube. The end of the tube was closed by twisting or otherwise and the tube enlarged by blowing. When alternating colors were used, these were often separated by uncolored rods. The same process was in use with composite rods. The tube was sometimes drawn out when closed, and this point became the very center of the flat dish, and was made to connect with the foot stand. At the same time the upper end of the tube was spread out, thereby widening the rods and their decorations, if such were present in the original rods.

TRINA OR LACE-GLASS RODS. The production of rods with inner opaque or colored spirals was quite simple. The art, common in the time of Augustus, was greatly improved by the Venetians, but ruined by the modern makers by too extravagant use of the technic. A hollow mould in the form of a shoe or flat tube, six inches or so long, was made of clay. In this mould was placed one, two or three opaque or colored rods, close to one side and close together. The rest of the shoe mould was packed with uncolored rods and the whole fused to adherence. When cold, the clay was removed, the glass bar was reheated and drawn out. At the same time as it was drawn it was twisted and turned, with the result that the opaque or colored rods assumed the form of spirals. Lace glass was made up of such rods.

BANDS AND RODS FUSED IN THE MATRIX. A purely decorative effect was produced by permitting opaque rods pressed into thin bands to fuse on the sides of flasks and dishes until they were incorporated in the matrix. For this purpose the glass vessel, flask or tube, was wound spirally with such threads and rods. When the fusion did not proceed too far, the bands remained on the surface. When continued

too long, part of the rods penetrated into the matrix while other parts remained on the surface. One of the finest urns in the Gréau Collection in the Metropolitan Museum was made by using bands made from stratified glass.

GOLD-GLASS RODS. Gold-glass rods were used both in the stratified-rod type and in beads. The technic consisted in covering a perforated rod with gold leaf and inserting it in a larger tube, and fusing the two elements to adherence. In the finished bead or vessel the margins had to be covered by fused glass, or they would separate. The gold never came to the surface unless the rod was broken. In the place of gold, silver was sometimes used. Beginning with the 4th century, enamel or plain earth color was also employed, but with inferior effect. We can therefore separate three types: gold-glass, silver-glass, and painted imitations.

INTERIOR MATRIX DECORATIONS. The object of this type or types was to imitate stones, such as marbles and onyx. It was accomplished by mixing cut, crushed or otherwise broken fragments of colored and opaque glass, together with uncolored pulverized glass. By using large colored pieces, square cubes, or sections of rods, a variety of patterns was produced. Some resemble brescia, others conglomerate, others onyx and chalcedony. As the true mosaic and millefiore glass began to disappear, the use of onyx glass increased or took its place. It is often difficult to determine whether a vessel or bead is made of onyx glass or of onyx, unless it is permitted to handle the vessel. If it feels cold to the lips, it is stone; if warm, it is onyx glass. If full of minute inner bubbles it is glass; if free, it might be onyx. The rings in natural onyx were imitated by the use of alternating transparent and opaque rods. The art never died out, nor was temporarily lost.

OPUS INTERRASILE OR OPEN WORK. This technic was common in the time of Augustus and continued. The best known specimen is the Varpelev cup found in Denmark. In this technic a cup of colored glass is covered with a holder in open work which permits the inner colored cup to be seen. The cover was of silver, gold, wood or glass. The Hermitage cup is of this type. Another cup owned by Baron Rothschild in Paris is entirely of glass.

DIATRETA GLASS. The name means "cut through" glass, because the vessel consists of an inner glass cup which is covered by and connected with a decorated glass holder in open work, by means of small glass pegs or supports, assumed by most writers to have been produced by cutting out the design from the same matrix as the inner cup. All authors date this type of glass to the 4th century A.D. because the specimens were found in German tombs of that period. But as tomb-finds in northern Europe were almost exclusively brought north by vikings and legionaries who acquired them by tomb robberies in the south, it seems quite probable that these precious objects belong to a much earlier date, probably the 2d and 3d centuries. Some may be even earlier. While it is possible, as has been actually done, to make such glasses out of a solid matrix, it seems probable that those found in ancient tombs were made by first covering the cup with an applied design, later cutting and polishing it like any cut glass.

LENSES AND PLATES

GLASS OPTICAL LENSES. Layard in his *Nineveh and Babylon*, p. 197, mentions that the use of lenses for focusing the rays of the sun were known to the ancients. Aristophanes, in *Clouds*, 746-749, makes Strepsiades propose to obliterate his debts from the wax tablets on which they were recorded by means of that transparent stone with which fires are lighted. Theophrast in *De Igne*, 73, refers to the same. A lens $1\frac{1}{2}$ inches in diameter, plane convex, was found at Nimrud. It possessed $4\frac{1}{2}$ inches focus. Seneca too describes how a hollow glass globe filled with water enlarged letters placed on the other side from the viewer. A plane convex lens was found at Nola, Italy, near Vesuvius, in a Greek tomb, according to Minutoli. It was set in a frame of gold and was 2 by 3 inches in diameter. Another lens was found in England, and others have been found in Pompeii, in Cyrenaica and at Mainz in Germany. Eyeglasses must have been known. Brutus mentions in a verse a certain Patroclus as a "faber ocularis" or spectacle maker. But there is reason to believe that the so-called emerald used by Nero in viewing the games in the circus was only a plain sheet of emerald-colored glass, of the type found in Sidonian glass of the "temple type" described later.

It is, however, not possible that the objects with which Archimedes is said to have fired the Greek fleet could have been made of glass. Certainly they were not refractors, because, on account of the lay of the harbor, the fleet must have been in the south and the city in the north. This would demand reflectors, not refractors. It seems most probable that it was reflected light, not fire, which confused the sailors. These reflectors might have been made of metal.

Recently a most interesting find of a pair of spectacles was made by Father Delattre, of Carthage, Africa, in a 5th century tomb at Carthage, according to information and a photograph shown me by Count Kuhn de Prorok. The lenses are of the size of ordinary lenses, apparently about one inch in diameter, ground plane convex or convex concave. They were set in bronze, which had so decayed that it could not be refitted. The numerous beads in the tomb are of the 5th century B.C., and include cuff beads, fig beads and beads with knobs and faces, such as are common in the Etruscan tombs, displayed in the Villa Giulio Museum in Rome.

WINDOW GLASS. A considerable number of window glasses have been excavated in Pompeii and at Ostia. The writer was present when a large pad-glass pane of glass was found in the excavations at Ostia, in a house of the 1st or 2d century. Such panes were set in bronze, stone or wood. Pieces of 30 by 40, or even 60 cm. have been found. They are generally thick, from two to six millimeters or over.

It is also related that the Roman gardeners grew early vegetables under glass.

MIRRORS OF GLASS. It is not known that the ancients knew how to make tin-lined glass mirrors before the 6th century A.D. Aristotle speaks of mirrors of polished metal covered with crystal. Pliny, who mentions glass, tin and quick-silver, does not associate these materials with mirrors. He says that the Sidonians made glass mirrors (36, 193). Pausanias mentions a mirror in the Temple of

Diana in Arcadia. With certainty, glass mirrors are mentioned in the 3d century by Alexander Aphrodisias (*Problemata*, I, 132). Beckmann, however (*Geschicht. d. Erfindungen*, III, 501), states that tin foil and glass was first used in the 6th century. The stone *fengites* mentioned as having lined the walls in the portico on the Palatine in the time of Commodus, has never been identified; not even a small fragment was recovered when the palace was excavated by Boni. This stone, possibly mica, reflected the image so that the emperor did not need to turn around to see the one who entered behind him. (Daremberg et Saglio, *Verre*; Michon, M. E., *Bull. Archeol.* 1919, pp. 231-250; 1911, pp. 191-207; Guimet, *Les Fouilles d'Antinoë*, p. 6; Garnier, *Hist. de la Verrerie et de l'Emallierie*, p. 48; also *Bull. Soc. d. Antiquaires de France*, 1891, p. 14; *Miroires du Musée du Louvre*; Kisa, *Das Glas*, p. 357; Marquardt, *Bonner Jahrb.*, 85, p. 156; Pliny, 36, 46.

The ancients, since the time of the Ptolemies, knew how to anneal glass with gold leaf, and it would have been strange had they not learned that metal so affixed also reflected images.

EGYPTIAN MOSAIC GLASS INLAY. The habit of using inlay of colored glass in metal, the colored glass units being separated by metallic boundary walls, was already known in the XIXth dynasty, and probably also in the XIIth. But as far as we know, the technic of fusing the glass elements before applying them, and thus doing away with the metal partitions, can not be earlier than the Ptolemies. In the metal cells the glass was fixed to the background by mastix or gum. The use of cement as fixing material originated with the Greeks about the time of Alexander.

ROMAN MOSAIC INLAY OF GLASS. It is certain that mosaic inlay of glass was used in the 1st century A.D. and probably before. Cubes of colored glass set in cement were of common occurrence in Pompeii, the best known specimens being the celebrated fountain niches in colored glass. The glass columns in the theater of Scaurus, of which Pliny and others speak, might have been of this kind, and not entire glass units as is generally assumed. The finest extant glass mosaic is the one in the Constantinean chapel adjoining the Lateran. It occupies the ceiling to the left in a small chapel, and is made with superb blue and gold cubes. Kisa gives a full account of this subject in his *Das Glas*, p. 368. From the references of ancient writers, it is evident that the covering of the walls with glass cubes and plates of mosaic glass was a favorite fashion during the time of the Roman empire.

As early as the time of Augustus, cubes of transparent glass with a gold film on the reverse side were in use and it is therefore erroneous to believe that such gold-glass cubes were first used in the 6th century, for example, the Byzantine mosaics in Ravenna. A beautiful panel of colored mosaic cube design with gold-glass background of the 1st and 2d century A.D. is now in a New York collection. It is also supposed that much of the mosaic fragments with microscopic designs, datable to the time of Augustus and the later Ptolemies, were used as inlay in furniture and as personal ornaments.

DEFINITIONS OF COMMON VESSELS—DISHES

SALVER. A flat dish with flat rim; sometimes slightly sunk in the center.
—Fig. 47, *a*.

TRAY. A flat dish with raised, perpendicular rim.—Fig. 47, *b*.

WAITER. A tray of undetermined size and form.

TRULLA. A flat tray with handles designed for receiving the drops poured from a ewer over the hands of the diners. Sometimes the trulla had a foot-stand oppo-



Fig. 47. Salver, waiter.—Trulla—platter—paten on top of chalice—1st to 4th century A.D.

site the handle in order to present the decorated side of the tray to view when not in actual use. The trulla broken by Petronius was famous, but its physical characteristics are unknown.—Fig. 47, *c*, *d*.

DISH. The name is derived from a disk or discus, a circular flat object used in contests of throwing. The latter was, however, entirely flat, whereas modern dishes are concaved in order to hold food, water or the like.

PLATE. A flat dish with sunk center and flat rim used at table.

SAUCER. A small plate, generally used as support for a cup but also to contain desserts, etc.

PLATTER. A large plate to contain food; generally of oblong form for greater convenience in serving.—Fig. 47, *e*.



Fig. 48. Phial, drinking cups, patella and patera bowls, 1st century B.C.—2d century B.C. Ptolemaic silver, *d*—probably "simplum" cup, *e*—Lower row, 1st and 3d A.D.

PATINA or *PATEN.* The eucharistic plate, its place when not carried being on top of and as a cover to the eucharistic chalice. It is represented on top of chalices of the 4th century A.D., as will be illustrated and described later. The patina was also used for serving and for cooking, and in the latter sense would correspond to our *pan*.—Fig. 47, *f*.

PHIAL. In Roman times a phial was a flat dish or plate with a central underneath concave boss. The cavity was for the placing of one finger in order that the vessel

might not slip from the hand during the libation. In the patella, also used for sacrifices, a cuff ring or foot, also hollow underneath, served the purpose of a finger grasp. It was also known as "phiale omphalotes," meaning a phial with a navel. When spelled *vial*, the name denotes a small bottle or test tube.—Fig. 48, *a*.

CUPS AND BOWLS

DRINKING CUP. Earliest drinking cups were fashioned after a section of a gourd. In the 1st century B.C. to the 1st A.D. the cups were semicircular and deep, often rather pointed, made of pad-glass, metal or pottery. The common kinds were without handles.—Fig. 48, *b*.

BOWL. Larger cups, generally with spherical body and without large handles. Used on a low tripod, unless furnished with foot ring.—Fig. 48, *c*.

PATERA BOWL. A bowl type common already in the time of the Ptolemies, made of silver or glass. The rim was more or less upright and not always included in the mould. The body was generally moulded and decorated with exterior flutings or ribs. Prototype, Ptolemaic silver patera; later, Sidonian, 1st century B.C. Flat forms of the Augustan era to the end of the 1st century, when once more they became higher, always without handles.—Fig. 48, *f, k*.

PATELLA CUP, SACRIFICIAL CUP. A much smaller cup suitable for being held in the hand of the sacrificer. Its body was contracted in three successive tiers from rim to base; each following the circular form until the 2d century, when the lower part becomes more funnel-shaped. These cups were always furnished with a low foot ring at the base, so as not to slip in the hand. All the early Roman emperors, when represented at the sacrifice, hold a cup of this type in the hand, a circumstance which gave the writer a clue to their nature. They are always made of the very finest material, ivory paste glass, mosaic glass or deep blue and emerald green glass. The earliest possessed a plain rim; the later ones, a bracelet.—Fig. 48, *i, j*.

SIX-SIDED BOWLS OR CUPS. A six-sided bowl of translucent emerald colored glass is known as the *Sacro Catino*, of Genoa.—Fig. 48; Kisa: Formentafel G., Fig. 392.

SIMPLUM. Sacrificial cups made of pottery, metal or glass. Also referred to as "*Simpuvia*" by Juvenal, 3, 340. Probably identical with the circular lotus cups used in the sacrifices, like those held in the hands of the early Roman emperors in the act of libations, as depicted, on the statues and reliefs, in the hands of the sacrificers. Other words are "*Simpinium*" and "*Simpurium*, genus poculi quod et gobata dicitur." The form is never described by ancient authors, but as they were used in the sacrifices the above identification is probably correct.

UPRIGHT VESSELS

Drinking glasses of metal, pottery or glass possessed full opening, wider or narrower than the body. The glasses were cylindrical or tapered slightly upwards or downwards, without a stand but often furnished with a foot ring. The different types merge into each other.

MUGS AND MEASURES. (*Modius.*) Cylindrical vessels made to contain a definite quantity of liquid, such as beer, wine, ale, milk, as sold in the shops and eating places. Always furnished with a handle. Drinking vessels of this form are seen in the Roman catacomb paintings, always depicted standing on the table. Wilpert's interpretation of a mug with handles as a eucharistic chalice is doubtful. When used as a measure in Latin times it was called a "modius." In modern times a mug containing about two quarts was called a "stoop."—Fig. 49, *a-c*.



Fig. 49. Measure and drinking cups.—1st, *a, b*—2d, *c, d*—2d to 3d, *e*—7th century A.D., *f, g*.

BOWL BEAKER. These are also called cups, when the vessel is very low and the height is that of an "ordinary" cup.—Fig. 49, *d*.

TUMBLER. This is a cylindrical cup with base rounded, so that it does not stand up when out of the hand of the user. In use in Lombardian and Merovingian times, between the 7th and 9th centuries A.D. The tumbler, beaker and goblet merge into each other so that no strict division can be drawn. Tumblers are represented on the walls of the Roman catacombs of the 2d, 3d and 4th centuries.—Fig. 49, *e, f*.

BEAKER. The trade name "beaker" is now applied to a cylindrical vessel of glass used in laboratories. They always possess a narrow drawn beak or extended lip for pouring the liquid from one vessel into another. The word beaker is also applied to cups with stand, so that we have plain beakers and beakers with stems, just as we have plain goblets and goblets with stems. Ordinary beakers are without beak.—Fig. 50, *a-j*.



Fig. 50. Beakers 3d to 4th, *a*—1st to 2d, *b, c*—3d, *d, e*—1st, *f*—6th, *g*—4th, *h*—5th to 7th, *i*—Arabic 9th to 13th century A.D., *j*.

GOBLET. A drinking cup often without stem, wide foot disk and a body widening upwards. The name comes from the Latin *cupa*, a cask, so that the original "little cask" must have been rounded or bulging about the center. *Cupa* in time became *cupellus* when used at the table, and finally a goblet. The original goblet had no stem. We must therefore distinguish between goblets and stem goblets, but with the clear understanding that the names are rarely properly applied, and often confounded with the term *beakers*.—Fig. 51, *a-f*.

STEM BEAKERS. Stemmed beakers have the form of plain beakers but are furnished with a stand or foot. The sides are cylindrical or funnel-shaped and in this

differ from the stem goblets which possess bulging sides. Mostly Arabic or possibly also Sassanian.—Fig. 52, *a-d*.

STEM GOBLETS. Vases with the body of a goblet with outward bulging sides, furnished with a stem, stand and foot. Some were used as Christian chalices for religious purposes (Fig. 53, *a-s*), but which were so used can not be determined.



Fig. 51. Goblet types.—Medieval, *a*—2d, *b*—1st, *c*, *d*—2d, *e*—4th century A.D., *f*.

CHALICES OF STEMMED-GOBLET FORM. The form of the body is truncate ovoid, with or without handles. The mouth part is either contracted or continued as the sides. The handles are medium sized, and never properly extend over the rim. The eucharistic nature of these objects is probable, but not certain. The type is also found in the 1st century Berthouville cup.—Fig. 54, *a-e*.



Fig. 52. Stem beakers.—Late or medieval—modern, *d*.

CARCHESIUM. A beaker-like vessel with bulging body, wide inwardly curving neck, a stem and foot. The contracted center should be narrower than the top and any other part of the body.—Fig. 55.

CARCHESIUM GOBLET. Concaved cylindrical sides with a bowl-shaped lower part, often decorated with laurel and ivy leaves, figures, etc.; lower part often fluted.



Fig. 53. Stem goblets.—I. Old types, mostly from Jewish coins, 3d to 2d B.C.—II. Holmos types, 1st A.D., *i*, *k*—4th, *l*—5th, *m*—2d, *n*.—III. Arabic and Venetian.

Type common in green glazed pottery, 2d century A.D.; rare in glass.—Fig. 56, *a, b*. *CRATER AND SCODELLA*. The crater was a large mixing bowl with wide, bulging body and an almost equally wide inwardly curved neck, the latter ending in a wide, funnel-shaped and spreading mouth. Handles, when present, are small, mostly attached to the shoulders in order to sustain a heavy weight. The name *scodella* was used for a soup bowl.—Fig. 57, *a-i*.



Fig. 54. Chalice types, 1st A.D., *a*—3d century, *b*, *c*—Arabic, *d*—4th to 5th A.D., *e*.

CANTHARUS TYPES. The typical form is a vase, with stem and foot; handles which rise from near the base of the body proper and, after reaching above the level of the mouth, curve inwards and downwards to the lip. The body gradually tapers to the stem, but is sometimes slightly curved. Few such forms entirely of glass have been discovered. The cantharus was specially consecrated to Dionysus and Bacchus, and is represented on their monuments. The Hermitage cup is in reality a



Fig. 55. Chalices and Carchesium goblets.—Ptolemaic, *a*—1st B.C., *b*—2d A.D., *c*—1st A.D., *d*—2d A.D., *e*.

carchesium goblet. Some of the Boscoreale cups, however, can be called canthari.—Fig. 58, *a-c*.

SCYPHUS CUPS. A low, wide bowl cup with two ring handles near the upper margin, always protected above by a flat lip projection or thumb rest, and some-



Fig. 56. Pottery beakers.—2d, *a*—6th A.D., *b*.

times furnished with a similar guard below the ring. They are common from the 1st century B.C. to the 1st A.D. in silver, glass, crystal and pottery. The delicate green glazed Syrian pottery cups of the 1st century A.D. belong to this series. The Varpelev cup and the Augustus and Tiberius cups of the Boscoreale treasures are all closely related. This form never occurs after the 1st century A.D.—Fig. 59, *a-c*.

SCYPHUS GOBLETS. Truncate ovoid cups with or without handles, wider than the ordinary goblets, often furnished with ring handles of the type found in the



Fig. 57. I. Craters and Scodella types.—XVIIIth dynasty, *a*, *b*—Augustan to end of 1st century A.D., *c* to *f*.—II. all 1st A.D.

Hildesheim, Boscoreale and Syrian green glazed cups of the 1st century B.C. to the 1st A.D. These are scyphi with high foot stands. Made of metal, pottery and glass.—Fig. 60.



Fig. 58. Cantharus goblets with handles.—Pottery Ptolemaic, *a*—Augustan, *b*—3d to 4th A.D., *c*.

ACETABULUM. A small urn or dish of uncertain form, for sauces and vinegar, in which meats and other viands were dipped. Also large salad mixing bowls and salad dishes. Also a measure of one-eighth of a sextarius.—Fig. 61.

DIPPERS, LADLES. (*Kyathos.*) Any vessel with a long free handle, used to dip out liquids from a crater or similar vessel. The handle was made long so that the hand of the servant might not come in contact with the liquid.—Fig. 61, *e*, *f*.

CALIX. A "cup" proper; the Greek, and especially the Athenian, drinking cup of the well-to-do. The body is wide with full opening and the handles are rather horizontal, in this differing from the handles of the cantharus, which are more or less upright.—Fig. 62, *a-c*.



Plate 5. Core-wound amphorisks with handles, late Egyptian from the Ptolemies to the Augustan era. University of Pennsylvania Museum, *a, b, c*; Mrs. W. H. Moore Collection, *d*.—See pages 122, 230.



Plate. 6. Gold-glass bottom with Amor and Psyche in relief. About 1st century B.C. Nies-
sen Collection.—*See page 134.*

JARS. Jars are deep vessels for storage of foods and therefore always used in connection with a cover. The name is revived in the Spanish *jarro*, a deep vessel for



Fig. 59. Scyphus goblets, Augustus to end of 1st A.D.

storing as well as cooking, generally of pottery. The form was in use in prehistoric Egyptian times. They are never furnished with a stand.

JAR. Common jar with more or less full mouth opening; cylindric or bulging body;



Fig. 60. Scyphus goblets.—Arretine pottery types, *a*, *b*—Glass, 2d to 3d, *c*, Edwards' collection.

flat base or with a foot-ring. There are many gradations in form and we might suggest names like bottle-jar, jar-flask, bowl-jar, etc.—Fig. 63, *a*.

URN. Cinerary urns of glass. A bulging jar, made to contain the ashes of the dead.



Fig. 61. Acetabulum bowls for salads.—A dipper, Augustus to end of 1st A.D.

The bulge is generally wider than the opening, which was always covered with a lid. The same general form persisted from the time of Augustus to the reign of Constantine. The variations have not yet been properly studied. Without stem and foot, but sometimes with handles.—Fig. 63, *b-d*.



Fig. 62. Calix cups, Augustan period.

PRISMATIC CINERARY URN. Prismatic form. 1st century B.C. to 2d A.D.—Fig. 63, *e-b*.

JUGS. Cylindrical or bulging vessels with large body, low neck and narrow neck

and mouth. Always with a small handle for lifting. The jugs were intended for temporary storage.—Fig. 64, *a, b*.

DEMIJOHN. The demijohn is a jug intended to hold a certain quantity of liquid for transport and storage. It is generally protected by wicker work (Fig. 64, *d*). It hardly ever possesses a handle. The contents vary from two to ten (or more) gallons. The neck is higher than that of the jug, but equally narrow. The demijohn, or damijan, was originally a wide, bulging vessel, sometimes compressed sideways.

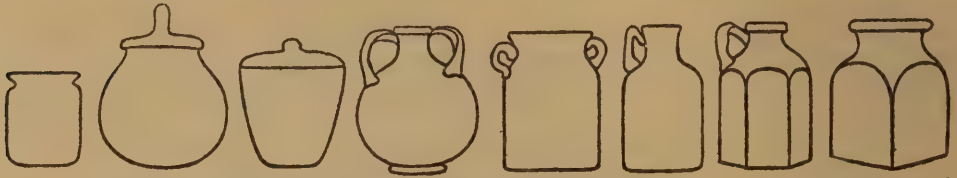


Fig. 63. Cinerary urns, storage urns, jars—1st A.D., *a, c*—2d A.D., *d* to *h*.

The name has nothing to do with the word *demi*, meaning half. It can best be derived from the Spanish *dama Juana*, meaning Lady Jeanne or Juana, the feminine of John. It took its name, so at least is the opinion of the writer, from its similarity in shape to the enormous dome-like, wide dress of the ladies in the time of Velasquez, when this word first appeared.—Fig. 64, *c, d*.

LAGUNA, LAGONA, LAGONARIA. Ancient jug for wine placed before the guest at table. When of large size, used to contain partly fermented wine and beer. Also known as flasks (*flaskion*). Early Roman empire.—Fig. 64, *a*.

STAMNIUM (STAMNIA). Cylindrical flasks of generally slender, never bulging body, with one or two handles between shoulder and lip rim, or ending on neck. Without base, base-ring or special foot and stand. Kisa dates the earliest from the

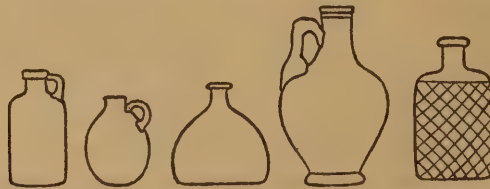


Fig. 64. Lagonas and demijohns.—1st century A.D., *a*—jug, *b*—Spanish demijohn, *c*—later or modern demijohn jug, *d*—modern demijohn, *e*.

1st century A.D. Those that are decorated either with serpent threads or ground-out patterns belong to the end of the 2d and the 3d centuries A.D., some having been found with Roman coins of the 3d century in Germany. Those with honeycomb cells and ovals seem to belong to the 3d century. The finest specimens of the latter are made of amber-colored glass with heavy walls. Those with honeycomb pattern were probably made in Syria, where some have been excavated, and thence imported to Germany.—Fig. 65, *a-q*.

BOTTLES

The distinction between bottles and flasks is one of convenience only, without real traditional differences. The name is derived from the Spanish *bota*, meaning a vessel in which wine was stored, or one carried in the saddle bags during travel, made of leather and pigskin. We now define bottles as vessels with ample body, narrow neck without handles, stem and foot-ring.—Fig. 66, *a*.

BOTTLES. Ordinary bottles for storing liquids.—Fig. 66, *a*.

PRISMATIC BOTTLES. Ancient bottles with four or six sides common in the early Roman empire.—Fig. 66, *b*, *c*.

FLAGONS. Bottles with long neck, bulging or spherical body with or without foot-

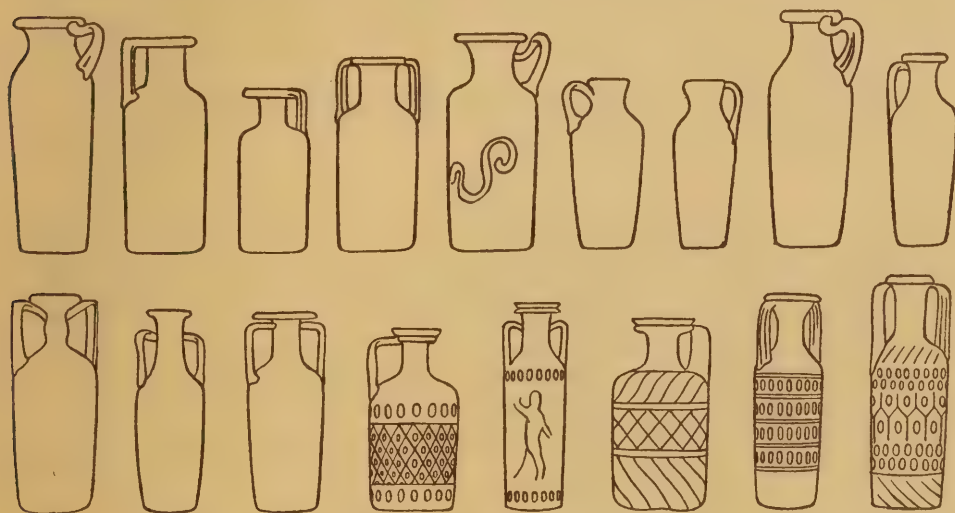


Fig. 65. Stannium or cylinder flasks.—1st, *a*, *d*—2d, *e*, *m*—3d century A.D., *n* to *q*.

ring. Used for wine, like modern Chianti bottles, common also in antiquity.—Fig. 66, *d*, *e*.

CARAFE. A bottle with downwards widening body, narrow neck, used at table service, but never for storing. Might with equal propriety be termed bottle and flask.—Fig. 66, *f*.

MERCURY BOTTLES. Prismatic flasks, four sides, tall, slender neck, narrow

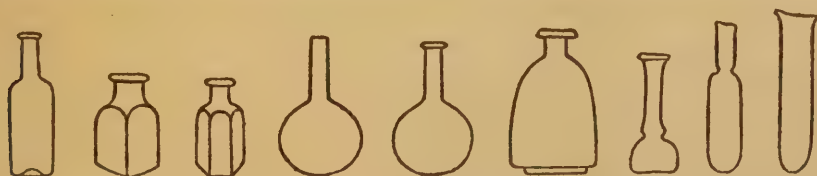


Fig. 66. Bottle types, prismatic bottles, flagons, carafes, vials.

mouth, with a lettered bottom, or with the figure of the god Mercury on base or sides. Generally coarsely made. Mostly of the 2d century.—Figs. 65, 67, g, h.

VIAL. As written, in modern use, a small tube bottle (or flask) used by the chemists as test tubes, etc. In the Roman empire era, they were used for unguents, perfume

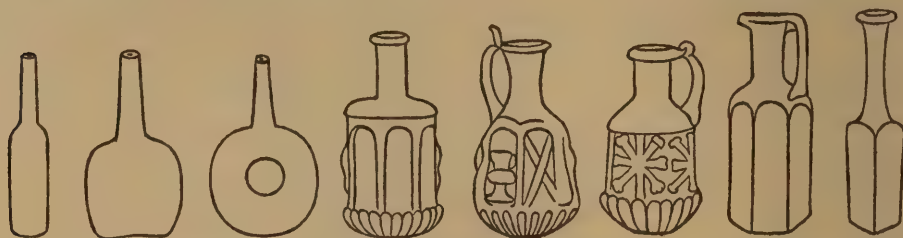


Fig. 67. Droppers; amuletic or Temple series, *d*—Processional, *e*, *f*—Mercury, *g*, *h*.

or as tomb paraphernalia. Innumerable bottles of this type have come to us from Roman and Syrian tombs.—Fig. 66, *i*.

FLASKS

Flasks are bottles made for some special purpose, such as for service at the table, for use when traveling, to fit the pocket, the knapsack and the bag, and so forth. But there exists no special characteristic whereby we may determine whether a vessel is a bottle or a flask, and sometimes a vessel is a bottle and a flask at the same time, as, for instance, the flagon and the Italian “fiasco.” Flasks are mostly furnished with handles, but are sometimes without.

The following are the most common forms, but many others could be added and might even be differentiated by names.

DROPPERS OR DROP FLASKS. Round or prismatic, characterized by a thin, slender neck with very narrow inner tube and a pinhole opening. Those of Arabic make are the most common in our collections.—Fig. 67, *a*, *b*, Arabic, *b*.

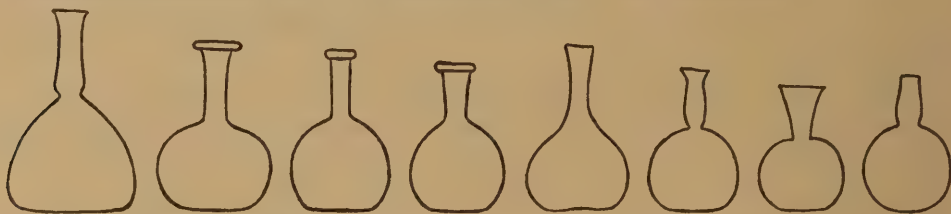


Fig. 68. Ampulla or ball flasks.—1st, *a*—2d, *b*, *c*—3d, *e*, *f*—4th, *g*—6th century A.D., *h*.

AMULETIC PRISMATIC FLASKS. The earliest of the 1st century A.D. are six-sided and more or less distinctly cylindrical (Fig. 67, *d-f*). Those of the 4th century A.D. are distinctly prismatic with four or six sides, each containing an amuletic sacred symbol (Fig. 67, *g*). The “Mercury” flasks of the 2d century A.D., with four sides, come especially from German tombs (Fig. 67, *b*).

BALL FLASKS, AMPULLA FLASKS. Small or medium-size bottles with rather long, slender neck and approachingly spherical body proper. Came into existence in the 1st century B.C. and continued during the next few centuries. The neck in the earliest types was contracted at the base and slightly widened at top. In later forms or varieties the pinched base of the neck disappeared, the upper part was greatly widened, the cylindrical neck was furnished with a collar rim, or the whole bottle was made of very heavy glass, and the top of the neck narrowed and squarely cut off without rim.—Fig. 68, *a-b*.



Fig. 69. Holmos and oil flasks.—1st B.C., *a*—1st A.D., *b*, *c*—2d, *e*, *d*—3d, *f*—2d, *g*—3d century A.D., *h*.

HOLMOS VASE. A Bacchic vase in connection with Bacchic altars (Daremberg et Saglio, Figs. 236 and 2424) carried in processions. The type is also represented on Sidonian glass bottles of the 1st century B.C. (*Museo Borbonico*, XII, Pl. XXI.)—Fig. 69, *a*.

LEKYTHOS OR OIL FLASK. The name was adopted by Kisa for any classic flask supposedly used for oil. The oil flasks of glass differed very much from the older ones made of pottery. Those of glass were made by free hand, and varied greatly in form and size. The most practical flasks were those with cup-shaped

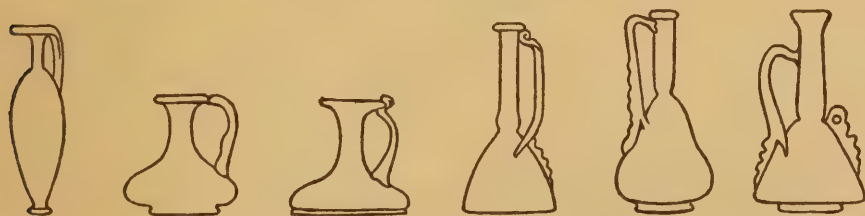


Fig. 70. Ketyliskos and Prochus flasks.—2d century A.D., *b*, *f*.

mouth, the cup catching the drops as the bottle was raised after using. Some of the most common forms of the 1st and 2d centuries are seen above.—Fig. 69, *b-b*.

KOTYLISKOS. A toilet vase with slender neck, upright body, handle and very small, flat base. Many of the 2d century flasks seem to have been based on this type and on the “*œnochoæ*,” the two being fused into one.—Fig. 70, *a*.

PROCHUS FLASKS. The body is greatly widened towards the base. Neck and handle always present. Most common in the 2d century A.D.—Fig. 70, *b-f*.

PITCHERS

PITCHERS. Vessels for holding and serving liquids at the table, at the toilet, in the kitchen. Always a full opening, contracted neck, wide body, and one handle. Sometimes furnished with stopper, and a foot ring, but never with a stem or stand.

PITCHER. For milk and water for table use. Body bulging, mouth full, pinched and drawn to a spout. One large handle.—Fig. 71, *a-d*.

EWER. A pitcher with a funnel-shaped neck and full, wide mouth, destined to

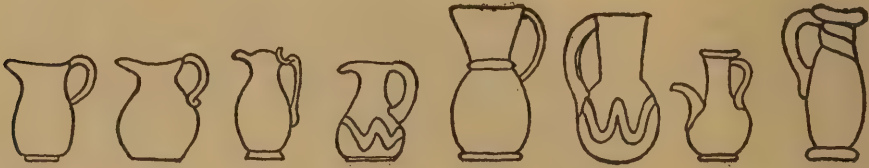


Fig. 71. Pitchers 1st, *a* to *c*—4th, *d*—ewers 3d to 4th, *e*, *f*—Persian, *g*—cruet, 4th century A.D., *h*.

pour water for table use or for carrying water from the fountain to the table. On this account it had a wide, funnel-shaped neck and mouth. It was also used on the washstand in connection with the water basin, or in connection with a trulla, to pour water over the hands of the guests after each meal, during the early part of the Roman empire, while at the same time a trulla, or tray with handles, was placed below the hands to catch the drops. Also used in pagan rites.—Fig. 71, *e-g*. *CRUET.* A small pitcher or water vessel, a diminutive of *crue*, a large pitcher.



Fig. 72. Wine flasks.—Enochœ—8th B.C., *a*—2d, *b*, *c*—purse vial, *d*.

Used on the table to hold vinegar and oil. It had a pear-shaped body, spout mouth, and one handle. Often placed in a caster together with another cruet, one for oil and one for vinegar. The eucharistic cruet had this form already in the early Coptic church service, and innumerable minute cruets were (4th century A.D.) suspended on necklaces as amulets. The eucharistic cruets held wine, water and oil. According to legend, the two famous cruets of Joseph of Arimathea contained the blood and sweat of Christ, collected at the burial and descent from the Cross. They were always furnished with a foot ring, if we may judge by the remaining amuletic specimens, which resemble those actually found in Coptic churches.—Fig. 71, *b*.

CENOCHOÆ OR WINE FLASKS. The Greek name for wine pitchers. Of no special form, but usually the body is wide, bulging; a low foot ring; a wide neck; one strong handle; wide pinched or trefoil mouth. Common in glass of all periods. 8th century B.C. to 2d century A.D.—Fig. 72, *a-c*.

BOMBYLIOS. A water bottle, originally made of leather and used on travels. The oblong, purse-like body resembled the body of a moth (bombyx), hence the name.—Fig. 72, *d*.

ASKOS OR PURSE FLASKS. Horizontally bent flasks in the form of a purse,



Fig. 73. Askos flasks or bottles, 1st B.C. to 1st A.D.—common in Pompeii, Tripoli and Sardinia.

with wide neck and rising basket handle. The neck is always at one side of the top, never in the center of the top. Generally of the 1st century. The form suggests a duck.—Fig. 73.

AMPULLA POTORIA. Lenticular water vessels. [*Apul. Flor.* 19.] Sometimes called *ampulla rubida*, and then covered with leather to withstand rough use in traveling. Often tied to the hand or shoulder of the traveler. Ampullæ also contained ointment for the dead body and were buried with the body in the tomb, which explains the quantity of these vessels found there.—Fig. 74, *a, b*.

ARYBALLOS OR HAND OIL BOTTLE. Globular bottles with wide, flat lip



Fig. 74. Ampulla jars.—Aryballos jar, sprinkler, canteens, 1st century A.D., *e, g, h*.

rim, very minute opening, one handle and a low neck; tied to the hand of one who anointed his body with oil previous to a contest. Common in Egypt, Greece and Italy.—Fig. 74, *c*.

HAND SPRINKLERS. A common name given to globular bottles with bulging body and neck, and diaphragm between these two parts, for the purpose of regulating the flow of the oil. Used in the bath or in the gymnasium for anointing the body in the way of the aryballos, but without handle. The bulged neck and the wide lip prevented the bottle from slipping in the hand.—1st to 3d century, A.D.—Fig. 74, *d*.

CANTEENS AND HAND FLASKS. Canteens and hand flasks are circular vessels suitable to carry while traveling. Their circular form increases their portability and prevents breakage. Some possess handles for straps or are furnished with wide mouth lips as guards against slipping from the hand. Some are flat and suitable for the pocket, others are rounded and spherical. The finest types date from the 1st and 2d centuries A.D.—Fig. 74, *e*.

CANTEENS. Canteens of leather, metal and pottery were used by the soldiers on



Fig. 75. Ampulla bottles, common types 1st to 2d century A.D.—Pilgrim flasks, *d* to *g*.

march or in camp in ancient as at the present time. They always possessed two small handles for straps which passed over the shoulder of the bearer. In Spain they are called *botas*, the origin of “bottle.”—Fig. 74, *f*.

POCKET CANTEENS OR PILGRIMS’ FLASKS. These differ only from the large canteens by their size, which were suitable to be carried in a pocket or in the hand during the bath, or when anointing the body in the gymnasium. Neck is low, body flattened, two minute handles near the neck for straps passing over the wrist.—Fig. 74, *g*.

AMPULLA, ORDINARY TYPES. Small to medium size bottles with more or less globular body, low neck and generally two handles for straps. Held oil and used in the bath.—Fig. 75.



Fig. 76. Pointed Amphora jars.—Thracian—Onidian—Rhodian—Roman—Oil Amphora —8th century B.C., *f*—Christian amulet, 4th century A.D., *g*.

AMPHORA. The original amphora was of pottery, and its name indicated that the vessel was made for carrying water, or, according to others, that it had two handles, one on each side. The word is composed of two units, one meaning “around” and the other “to carry.”

The glass amphoræ are miniature vessels as compared to the gigantic sizes of those made of pottery. The base is either pointed and requires a tripod for support, or the base is flat, like the Portland vase, which is often included in the amphora

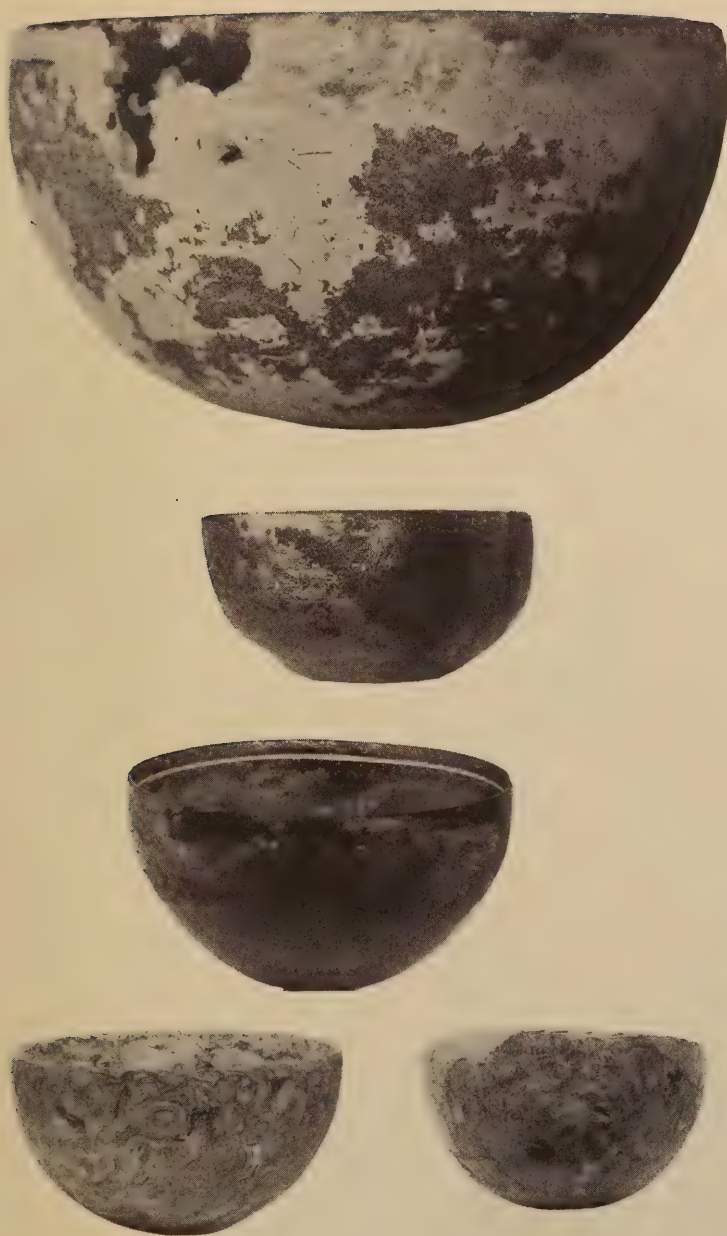


Plate 7. Pad-glass cups about 2d to 1st century B.C. Syria. Mrs. W. H. Moore Collection, *a*; Metropolitan Museum, *b-e*.—*See page 134.*



Plate 8. Moulded and ground pad-glass cups 1st century B.C. to 1st century A.D. Metropolitan Museum, *a*; Mrs. W. H. Moore Collection, *b*, *c*; Fahim Kouchakji Collection, *d*. Syrian.—See page 151.



Plate 9. Cinerary Ash Urns. The four standard types, common and widely distributed, 1st century A.D. Metropolitan Museum.—*See page 152.*

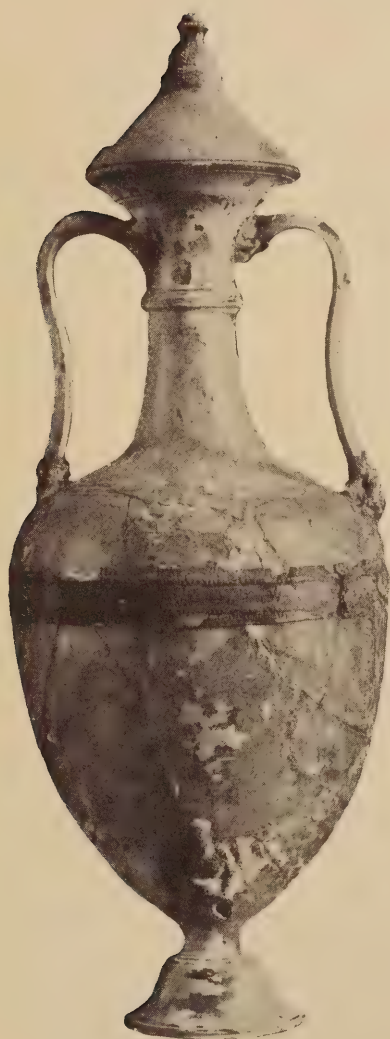


Plate 10. The Olbia pad-glass vase, 0.790 m. high, 1st century B.C. Berlin, Neues Museum, from the Nikolajef Collection. Found at Olbia.—*See page 152.*



Plate 11. Cinerary pad-glass urn, with stratified glass strips fused in the matrix. Metropolitan Museum. Found in the north of Italy. 1st century B.C. to 1st century A.D.—*See page 153.*



Plate 12. Pad-glass with enameled painted scenes on olive-green matrix. Probably Alexandrian, Augustan era, believed to have been found in Syria. Made of cut and ground tubes. Mrs. W. H. Moore Collection.—See page 153.



Plate 13. Pad-glass craters. Syrio-Roman types, 1st century B.C. to 1st century A.D., persisted in the early part of 2d century A.D.—*See page 154.*



Plate 14. Pad-glass urns of blue glass with gutta drops. Syria. 1st century B. C. to 1st century A.D. Mrs. W. H. Moore Collection, *a*.—See page 154.

type. The large pottery amphoræ with pointed base could stand erect by themselves if pushed down in a bed of soft sand, and were then used for storing liquids. When a tripod was used, the vase was probably made of porous clay and used as a filter and cooler for drinking-water, in the manner we find it used in Greece, Italy, Spain and all Latin-American countries. The amphoræ of ancient times possessed beauty and elegance and on that account are best known of all classic vessels.—Fig. 76, *a-e*.

AMPHORISKS. This name is applied by Kisa and others to minor vases with two handles recalling the larger and better formed amphora. The earliest glass amphorisks appeared about the 9th to 8th century B.C. and were much in use as toilet vessels made by the core technic.—Fig. 76.

ALABASTRONS. Small vessels made of alabaster or similar semi-translucent mineral, first made in Egypt. Cylindrical, widening towards the base, which is rounded, with or without minute ear-handles. Some apply the name incorrectly to Egyptian columnar unguent bottles and balsam flasks.—Fig. 77, *a-c*.

BALSAMARIA OR BALSAM VIALS. Any small vase of whatsoever form destined to the use of balsams, unguents, perfumes, used from the time of the XVIIIth dynasty to medieval times. They were always made of heavy glass.—Fig. 77, *a-b*.



Fig. 77. Alabastrons, balsam vials, columnar and ritual vials.—4th B.C., *a*, *b*—XVIIIth dynasty and later, *c*, *d*, *e*—4th century A.D., *f*, *h*.

COLUMNAR OIL FLASKS. These interesting flasks appear in 4th century tombs, and are often found with inner bronze rod or spatula. They connect directly with the Egyptian flasks of the same general form, but with lotus capital (Fig. 76, *d*). The body is twisted in the form of the two columns brought from Jerusalem, and now in the Basilica of St. Peter's in Rome, believed to have stood in the house of Pilate. The 4th century vessels were probably copied from these columns, their use probably being ritual.—Fig. 77, *d*, *g*, *b*.

RITUAL CUPS. (Also "mystic vases.") A well defined group of amphora type with wide mouth, two (or without) handles, pointed base, and low, wide, twisted and ridged body, or body decorated with waves. All seem to belong to the 4th and 5th centuries A.D. They are without doubt of amuletic use, possessing the same form as the Coptic eucharistic representations of vases placed on columns on each side of which a dove is seen partaking of the contents, which can only be the eucharistic blood or Water of Life. A few have the form of amphorisks. Always made of very thick, heavy opaque glass, smooth or deeply creased. Christian, symbolic "mystic vases."—Fig. 78.

MINOR OBJECTS OF GLASS

FINGER RINGS OF GLASS. Finger rings of glass were known to the Greeks and were called "sphragides hyalinai." They became quite common in the Roman empire period and were made either in one piece of the same glass or the frame was of one quality of greenish glass and the inset of one of different color, generally blue. The inset was either in intaglio, sunk or in relief. The number of glass intaglios found is very great. Castellani related to the writer that several thousand were found in a pot on Monte Mario in Rome, but most of them were so corroded as to be considered of no commercial value. The reliefs were generally copies of similar ones in hard stone, but not all on the market sold to collectors are ancient. Imitations were made by the Venetians and are made to-day, and sold as genuine and antique. If such "stones" possess patina and the odor of earth they are probably ancient and well worth studying. If, on the contrary, they are glossy and lack the earthy odor, they should be studied for genuineness.—Fig. 79.



Fig. 78. Mystic jar.—4th century A.D.



Fig. 79. Finger ring of glass.—2d century A.D.—Collection of Mrs. W. H. Moore.

GLASS BEADS

GLASS BEADS. The glass beads can here only be referred to by name, as a fuller description would occupy ten times as much space as that on glass vessels. Glass beads of opaque matrix began to be made in quantity during the XVIIIth dynasty in Egypt, but according to dated collections in the Metropolitan Museum, small glass beads were made already during the XIth dynasty. The most perfect and beautiful beads were made in the time of Thotmes, Amenhotep and Rameses the Great. During the 5th century B. C. the most brilliant and showy beads were made. Mosaic beads appeared in the time of Augustus and continued with ever varied form, size and color to our present day. Beads with decorations of twisted rods, and large ring beads appeared in the 2d century A.D. The art degenerated in the 4th century, but revived in the 5th and reached a certain brilliancy, with brick red, lemon yellow and deep orange, and emerald opaque green in the 7th to 8th centuries. After that time a new deterioration set in and during the 9th to 12th centuries beads without beauty and skill are found in the tombs. The art was revived by the Venetians, whose only beautiful beads were the star beads, which in striking effect surpassed most beads made during the Roman empire. Since four hundred years past the beads have been inferior in beauty, with inharmonious colors. An ex-

ception must be made for old Japanese beads, how old cannot be determined, which are highly interesting and worthy of our study and admiration.

MELON AND LOTUS BEADS. The most important, certainly the most interesting, beads made of glass and pottery in antiquity are those known as melon beads, though they should with more propriety be called lotus beads. They are ribbed and possess the same form as a cantaloupe melon. In another place the

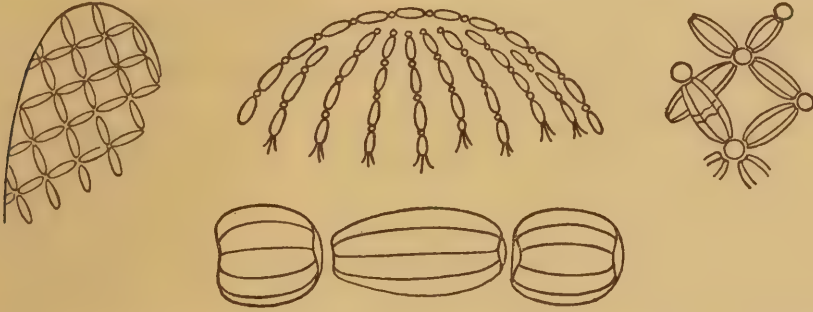


Fig. 80. Amuletic bead coverings of the Omphalos at Delphi, as portrayed on the original as well as on reproductions on painted vases. The last three beads, part of a string portrayed on animals led to the sacrifice. Believed to keep off the evil eye.

author has already shown that they were originally, that is in the XVIIIth dynasty, derived from the lotus bud, the idea and symbolism perhaps going back to pre-historic times. A lotus bud in the form of a bead is in the Metropolitan Museum, dated to prehistoric Egyptian times and it seems probable that this early type connected with the later one in the time of Amenhotep.

Having been derived from the sacred lotus flower, the beads were themselves sacred, and it is thus that we find them in early Italian tombs of the 8th century B.C., continued to the 7th century A.D. as tomb relics, derived from older tombs. The early beads of this type had a pin-hole bore, but in the 8th century the bore became very or abnormally wide. The fact that handfuls of such melon beads were scattered in the tombs, from the 8th century to later, suggested to the author that they were sacred and it was they, the lotus buds from the lotus lily, that gave origin to the habit described so touchingly by Virgil of scattering lilies over the tombs of the beloved dead. "Date manibus lilia plenis," he wrote at the appearance of the shade of the nephew of Augustus—"Scatter lilies with full hands." This suggested that the lilies and the lily lotus beads were talismanic and were scattered over the tombs in order to keep the shades from rising. This was confirmed by a study of the various representations of the Greek omphalos at Delphi, which are often shown covered with a network of melon or lotus beads strung on the mesh threads. The net of melon beads or lotus beads must have been thrown over the omphalos, the tomb of Python, to keep that demon from rising. It had been slain or confined by Apollo, a theme fully developed and proven by Harrison in *Themis*. But until now the peculiar covering of the tomb has never been explained.

The amuletic form of the lotus bead is resurrected in the sacred loaves which in ancient times decorated the animals that were to be sacrificed at festivals on the altar. All ancient representations show these loaves to have the form of gigantic lotus beads, as, for instance, those on the *Anaglypha Trajani* in the Forum in Rome. The form of these bead-loaves was spherical or oval. Sometimes the length was several times that of the width.—Fig. 80.

APPROXIMATE CHRONOLOGY OF BEADS

2000 B.C. Earliest Egyptian, IXth dynasty, glass beads; tubes; cuffs.

1800 B.C. Earliest Egyptian glass amulets.

1500 B.C. Lotus beads with narrow bore; tubes with swollen ends; disks; at first eyespots of impressed rings, later of stratified layers; end caps.

1200 B.C. Fluted turbinate beads; perfect, minute ring beads; beads from rods and threads twisted over a wire or bronze rod.

1000 B.C. Horizontally creased lotus beads; turbinate beads; halved beads.

900–800 B.C. Earliest uncolored, transparent glass beads; coarse rings; roughly four-cornered beads with knob ends; dull blue cuffs with white eyes.

800 B.C.–700 B.C. Tricornered flattened beads; amuletic lotus beads scattered broadcast in the tombs.

700 B.C.–600 B.C. Compressed turbinate beads; large cylinders with cut-off or tapering ends, dragged patterns; cuffs with white waves; earliest rolled-in drops and granulations. Plain button beads.

600 B.C.–400 B.C. The most brilliant bead period of antiquity, in Italian and Etruscan tombs: fig beads; spheres of dull orange with blue and white eyes; caput beads, cuffs with faces, Pan, fetishes, sheep heads; portrait faces, priests heads; beads with superposed knobs.

400 B.C.–300 B.C. Tubular beads with tapering ends, dragged patterns, decorated button beads, begun in the previous century, continue; large beads with superposed knobs; ring beads, four- and three-cornered beads with threads wound around the corners.

300 B.C.–100 B.C. Earliest gold-glass beads, lotus types, cuffs, tubes.

100 B.C.–1 A.D. Mosaic glass beads; stratified glass beads; empress beads; vermillion matrix, cut-off rod eyes replace the stratified ones. Imitations of crystals; double pyramids.

100 A.D.–300 A.D. Twisted rods as bead decoration; large ring beads with crossing lines; beads with yellow end caps.

300–500 A.D. Black predominates; beads increase in size; cubic forms; amuletic vessel beads as pendants. Turquoise blue appears.

500 A.D.–700 A.D. Merovingian, Lombard, Saxon, Hungarian, Fayum beads. Venetian red predominates; turquoise blue; orange; perfect dragged technic; single and crossing waves, links.

1500 A.D. Venetian star-beads invented.

PART II. DATES: SYSTEMS OF SYMMETRY: CHRONOLOGICAL PERIODS

DETERMINATION OF THE DATES

THE date of glass vessels is determined in various ways—by the material, by the form and by the design or decorations. It can also, but with less certainty, be determined by the known date of objects found in the same tomb as the glass. And vice versa, the date of the contents of the tomb can be determined by the glass vessels or by the beads. Coins and fibulas, or safety pins, when found in a tomb, are valuable for determining the date, because they are fairly well dated themselves. But coins were often hoarded, sometimes even for generations, so it is quite possible that they may be a century or so older than the rest of the tomb. The matrix of glass vessels and beads is often of great value in dating, because it underwent a steady improvement or a degeneration from century to century. The earlier glass contained bubbles of air; the later glass was free from such bubbles. The color and transparency of the glass is also of importance in judging the date, certain colors or tints having been introduced at different times. For instance, clear uncolored glass appeared first in the 8th century B.C. and was lost in the 5th A.D. Orange as a color was introduced in the 5th A.D. Debased deep brown glass was never used in vessels until the latter part of the 4th A.D., and the first pure, uncolored glass after that time was invented by the Arabs.

Decorations are of great importance in determining the date, because every age had its own taste, its own pattern, its own technic, and its own ideas of beauty. A beautifully designed and well proportioned figure or face must have been made before the art deteriorated after the death of Nero, for after that time military leaders and their wives alone set the fashion of taste and beauty. Religion too had a great influence upon the taste and the design, beauty being of utmost importance among the Greeks and the Romans so long as they were pagan. But when they became Christian, sadness, piety, and suffering were the main factors to stimulate art. At this time too, symbols and emblems superseded representations of deities and stamped their characteristics upon the artistic objects of the time.

The form of the vessels is of the greatest importance and aid in determining their date, even at times when older art forms were being revived, reintroduced and imitated. Such imitation was never accurate, for new ideas and uses had to be

satisfied, and old forms had to be reproduced in new material and with new technic. This permits us to determine the date of these objects with considerable, and often with absolute, certainty. An aid in recognizing the form of a vase and its date is often found in the exact proportions with which the vase was designed and made. The most important proportions are those derived from the use of the Dynamic Symmetry rediscovered by Hambidge. Its major use in glass was discontinued in the 1st century A.D., but all the combinations of the system did not disappear simultaneously, the root-3 system remaining longer than the other combinations. Together with the consideration of the general form came the forms of certain details, such as handles, mouth, lip, foot stand, each taking its own characteristic shape from the taste and usage of the period.

A great aid in determining the date is derived from a comparison with pottery vessels of the same period. Their form always goes hand in hand with that of the glass vessels, the latter being inspired by the former as well as by the metal vessels of the same period. But while the glass-makers must have known their contemporary vessels of metal and pottery, they could have had no idea of the appearance of very much older vessels or art objects. In the time of the ancients, public museums were unknown and even private collections could not have included anything but large objects such as statuary, paintings and some precious gold or silver object handed down in the family. Any actual study of the minor arts was reserved for our own time.

GEOMETRIC SYSTEMS OF SYMMETRY

Since very early Egyptian times the artists who designed reliefs and paintings, and the architects who designed structures, made use of certain geometrical figures in order to facilitate their work. The earliest geometrical figure used seems to have been the square. Later a rectangle was used. This rectangle was either drawn at random or according to a certain geometric principle. Others used the triangle and the circle as units to confine form. All the most careful and successful artisans and artists of all ages and of all countries have made use of some such geometrical means to insure regularity of symmetry in their designs. The manner of their use differed, but up to the present time no one has been sufficiently interested in this subject to consider and study these many systems impartially and without bias. In fact the subject has received such scanty attention that even now the opinion is prevalent that all such geometrical aids were used to facilitate enlargement, which opinion is erroneous. Until Jay Hambidge's recent announcement of his discovery of the Dynamic Symmetry, this subject had been so neglected that most students of art and architects had forgotten that some such system had ever been in use. As with everything new, the Hambidge announcement aroused tremendous opposition, seemingly because it introduced into art a new element, and too because it was presented with such a wealth of mathematical detail that it was most difficult to understand and to master by those not mathematically inclined. Considered as an entirely new system, the Hambidge rediscovery was most startling and would

admit of much controversy. But considered as but the development of an early simple system, all criticism at once falls flat. For there is incontrovertible proof that a simpler system did exist, as it still does. This all can realize for themselves by simply viewing some of the old Egyptian reliefs in our public museums. The rediscovery of the more intricate system by Hambidge shows but the further development of the application of geometrical figures in composition.

With the above points fully in mind we must at once realize that simplicity of design has existed since art began and while from time to time it fell into misuse or neglect, it was always resurrected and, at the same time, made to follow certain sane rules, so as to please a logical, orderly and calm mind. This subjection to rule was perhaps first evident in the restraint of the outline of the whole, its boundaries being confined within certain limits, such as a square, a rectangle, a circle or some such orderly form. The next step was to cause the interior nodes of the design to conform in some definite manner to the form of the outlines, the result and effect being to produce a pleasing balance. Through such planned conception a better realization of the design can be had at a glance, and any one viewing it does not need to wonder what it all means and stray with his eyes over the entire surface in order to seize upon the salient point as is so often necessary with so much of modern art. The unrestrained design may be likened to melody with discordant notes, while the static system, soon to be more fully described, recalls melody based upon a simple but harmonious scale, and the dynamic system reveals its perfection in the same manner as does a musical composition created according to the rules of counterpoint.

For a better understanding of this subject we can classify its steps of development in the following simple manner:

ASYMMETRIC DESIGNS. Made with free hand without even a thought of the possibility of geometric aid, or even with the definite intention of being as irregular as possible. The asymmetric design has always been in use.

THE STATIC SYSTEM OF SYMMETRY. Based upon the even divisions and additions of a square, two squares, one and a half square, or a square and a fourth of a square, produced by equal divisions of the side of a square. The static system has always been in use since man, emerging from savagery, conceived the simplest and most perfect geometric form—the square.

THE DYNAMIC OR GRÆCO-EGYPTIAN SYSTEM. Based on the use of one side of the square and the diameter of the same square, or upon the diameter of half the square. This system grew out of a further development of orderliness in thinking, resulting in a higher and purer harmony. Discovered during the early Egyptian dynasties and developed by the Greeks, it was discontinued about the end of the 1st century, both because of conditions antagonistic to further art development and because of decreased appreciation of all art, having reached its zenith at the time of Polycletus.

THE GEOMETRIC ACCUMULATIVE SYSTEM. The use of geometric figures and areas in the construction of architectural creations as well as in sculpture and painting must have begun with the regeneration of architecture after Constantine,

and reached its perfection during the Gothic period and the Renaissance. In this system, squares, triangles, pentagons, hexagons and other geometric figures were accumulated into a design, or plan, probably at first for the ground plan of an edifice, such as a temple or church.

The various systems and attempts at systems, invented by the Chinese, the Hindus, the Gothic architects and the Renaissance painters and sculptors must be held accounted for in this general system, at least temporarily until they have been more thoroughly analyzed.

DEFINITIVE CHARACTERISTICS OF THE THREE METHODS

ASYMMETRIC DESIGNS. The asymmetric designs are those which are drawn by free hand without the aid of geometric and mathematical principles. In this method the artist generally tried to follow nature, or in the case of pottery, glass and similar art objects, his own taste. This method has always been in use, even by the greatest artists, and lately the claim has been put forth that it constitutes the only principle worthy of being followed, for any geometrical method would inevitably "hamper the development of the genius of the artist," and hence make his work non-artistic. It is of course entirely wrong to call this lack of system "the static system," as has lately been done. In this system "common," or so-called "exact," regularity is banned. The great majority of art works, especially sculptures and paintings are asymmetrically designed.

THE STATIC SYSTEM. The method of using the square, divisions of a square, or equilateral rectangles and circles, as basis for a certain harmony in design, is now generally referred to by students of the dynamic system as the "Static System of Symmetry." It is considered by them inferior to the latter system and hence valueless and unworthy of consideration. This is wrong. The static system was in use long before the dynamic system came in general use and it is yet. Both systems are based upon the square, the square in the static system divided in half, in thirds, and so forth according to the fancy of the artist. The static system was employed during the 1st century B.C. and in the 1st century A.D. by the moulders of glass and makers of pottery, and has been more or less used since. But the static system is inferior to the dynamic system, because a rectangle consisting of a square plus half a square can not be so subdivided that its component parts have the same form and proportion as the whole area. The hexagon and the circle are also part of the static system.

How the static system was used will be described later. Here we will only point out that one type of rectangle of the static system was constructed by adding half a square to a square. Such an area is divisible in three equal parts, but neither possesses the same form and proportion as the whole. Or one can add a square to a square, and the resulting rectangle can be divided in two squares, but the whole area possesses neither the same form nor the proportion of the original area.

Another defect of the static system is that except in one type of rectangles, the



PLATE II. URN OF BLUE GLASS WITH ENAMEL DECORATIONS. AUGUSTAN ERA.
MRS. W. H. MOORE COLLECTION. SEE PAGE 154.



Plate 15. Scyphus cups, Augustan era. The Varpelev cup, silver over glass, *a*; Metropolitan Museum, *b*; Louvre, *c*. First half of the 1st century A.D.—See pages 44, 154.



Plate 16. The Portland cameo vase, British Museum. 1st century B.C. to 1st century A.D.
Photographs by R. B. Fleming, London.—*See page 156.*

division is not produced by drawing a line from an angle perpendicularly against the diagonal. Such a line if prolonged will never divide the whole either in equal parts nor in parts of the same form and proportions as the whole. Nor can a logarithmic spiral curve be produced from, or by means of, any rectangle in the static system, except from that which is composed of two and four squares in a row, two squares in a row corresponding exactly to a root-4 rectangle in the dynamic system.

HOW TO CONSTRUCT RECTANGLES OF THE STATIC SYSTEM. First make a square, then add to this square a half square of the same size and proportions as one half of the original square. This gives a rectangular area of a square and a half. Or add two squares, three squares or four squares in a row. In this manner we can construct innumerable rectangular areas composed of and divisible into half or whole squares but, as already stated, the divisions will not be equal to the whole in form and proportion.

A square area composed, let us say, of sixteen minor squares, will give us, if divided by diagonals each way, a great number of points which can be used as guides for the construction of vessels, designs and architecture. If the object is to be rectangular, add more squares or half squares. Regular curves can be made in such a diagram by connecting a center of one square with the corner of another square and so forth. The use of such a diagram is practically endless, but the result is not quite as pleasing as if the areas of the dynamic system were used.

The diagram of a vase based upon this system will show in what manner the system is useful.—Figs. 81, 87, 90.

THE DYNAMIC SYSTEM OF SYMMETRY. Areas when divided by means of a diagonal and a perpendicular against this diagonal, produce divisions or areas, each of which possesses the same form and the same proportions as the whole. While an unlimited number of rectangles might be constructed, the *main* rectangles of the dynamic system of symmetry are but five in number: the whirling-square rectangle, the root-2 rectangle, the root-3 rectangle, the root-4 rectangle and the root-5 rectangle, each of which possesses the quality mentioned above, which quality is not found in other rectangles, whether of the asymmetric, the static or the dynamic systems.

As we possess positive proof that each of the three systems was in use in ancient times, the discussions by opponents to the Hambidge theory need not be considered here. Their opposition would never have been put forth if Hambidge had from the first emphasized the fact that the ancients also used other systems, and that the dynamic system is but a development of the static, just as the static is a development of the asymmetric.

The dynamic system was used in Egypt since the IVth dynasty, being, according to Hambidge, confined to sacred objects. The Greeks, however, who derived their knowledge of the system from Egypt, applied it to all artistic objects. At that, they did not entirely discard the two earlier inferior systems, which continued to be used by some artists who either had no knowledge of the dynamic system or who did not understand the benefits of its use. Unlike the static system, the dynamic is not

conspicuously regular. It is only harmonious. This harmony is subtle and of an entirely different kind, for instance, from that which demands that doors and windows in the front of a house be placed at the same exact measured distances of a meter or multiples of a meter or a foot.

CONSTRUCTION OF DYNAMIC RECTANGLES. The basis of the system is, as we have said, a square; but instead of forming a rectangle of larger size by adding to the square a quarter, a half of a square, or another square, we erect the rectangle

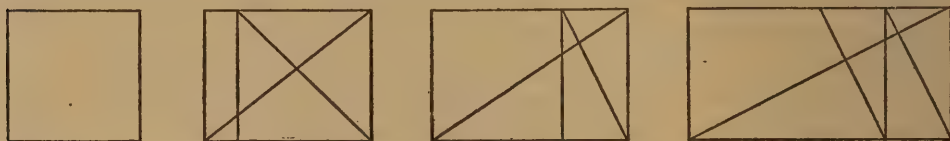


Fig. 81. Development of diagrams of the Static system based on a square and fractions of squares—a square—a square and a quarter—a square and a half—two squares.

by using the diagonal of the square as base, or, in other words, we continue or extend the base of the square until it is equal in length to the diameter of the square. The resulting area is known as a root-2 rectangle, because it naturally divides itself, by means of a diagonal and a perpendicular against this diagonal, in two halves, each of which possesses the same exact form and proportions as the original rectangle. It is the only rectangle which when divided into two halves, possesses the same form as these halves.—Fig. 82.



Fig. 82. Dynamic system.—Development of the diagram of a root-2 rectangle—a square—the root-2 rectangle—division of the rectangle in two parts—root-2 rectangle inscribed in a square.

If a longer rectangle is required, we make use of the diagonal of a root-2 rectangle. In other words, we continue the base of a root-2 rectangle until it is as long as the diagonal of that root-2 rectangle. Then we raise a rectangle upon this whole base, keeping the side of the original square, which is also that of the side of the original

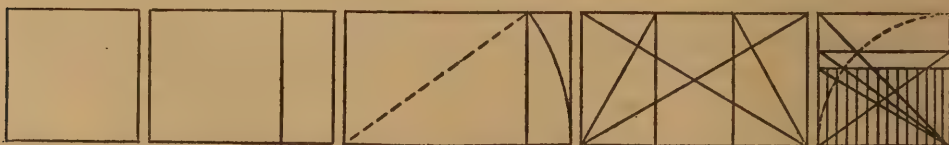


Fig. 83. Dynamic system.—The root-3 rectangle and its development from the square—from the root-2—its division in three equal parts—root-3 inscribed in a square.

root-2, as side of the new area which is a root-3 rectangle. This root-3 can be divided in three equal parts, each of which possesses the same form as the whole root-3. No other rectangle will possess that quality. The same process will produce a root-4 rectangle from a root-3, and a root-5 from a root-4, and so ad infinitum. But if a longer area than a root-5 is needed, it is best to add another root-5, or we can add a square. There are many other combinations of dynamic rectangular areas possible, but as these were not used at a time when glass was moulded, their consideration is not within the scope of this essay.—Figs. 83–85.



Fig. 84. Dynamic system.—Development of a root-4 rectangle from two squares—logical diagram.



Fig. 85. Dynamic system, the development of the root-5 rectangle.—Square—two squares—two squares with diagonal—diagram of root-5 rectangle.



Fig. 86. Dynamic system. Development of the whirling-square rectangle from a square.

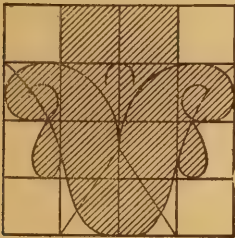


Fig. 87. Static system, diagram of the construction of capital of Egyptian column, XXVIth dynasty.—Metropolitan Museum, ancient design on marble.

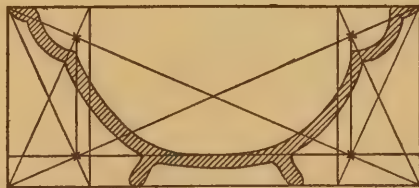


Fig. 88. Dynamic system, root-5 rectangle.—Diagram for construction of a Sidonian sacrificial patella cup, 1st century B.C.

THE WHIRLING-SQUARE RECTANGLE is produced from a square, by using the diagonal of half the square extended from the center of the base of the square until the whole line is as long as half the base plus the diagonal of half the square. The new base is longer than the root-2 base but shorter than the root-3 base. The name

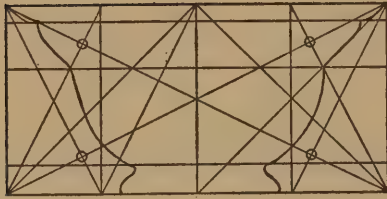


Fig. 89. Static system.—Diagram of a patera sacrificial cup, 2d century A.D., based on two squares.

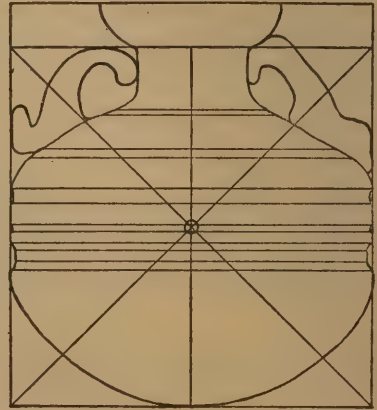


Fig. 90. Static diagram, oil flask based on one square plus $\frac{1}{8}$ of a square.—1st A.D., from Pompeii.

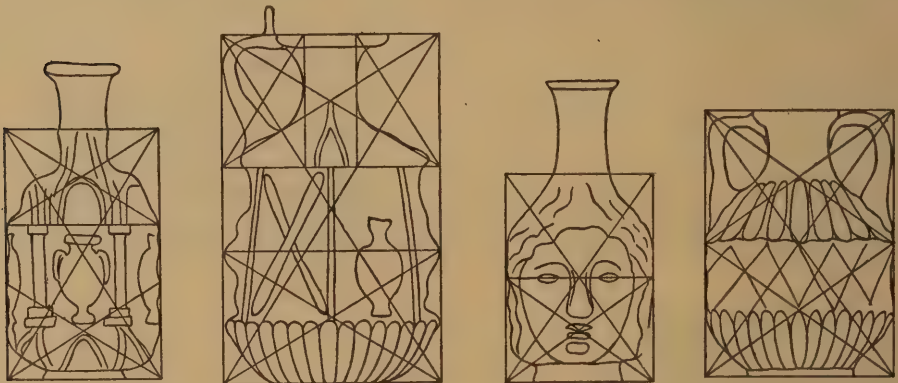


Fig. 91. Dynamic diagram of four Sidonian flasks, 1st century B.C., based on the whirling-square rectangle, and on a root-2 rectangle.

is derived from the fact that the logical division is not in halves or thirds, or fourths or fifths, but in a square plus a whirling-square rectangle. By repeating the divisions in the same manner, a spiral of squares is produced, each succeeding one smaller than the first. The resultant division ad infinitum gives a better idea of infinity than any other visual demonstration known. The finest Sidonian moulded vessels of the 1st century B.C. are based upon whirling-square areas.—Figs. 86, 91, 93.

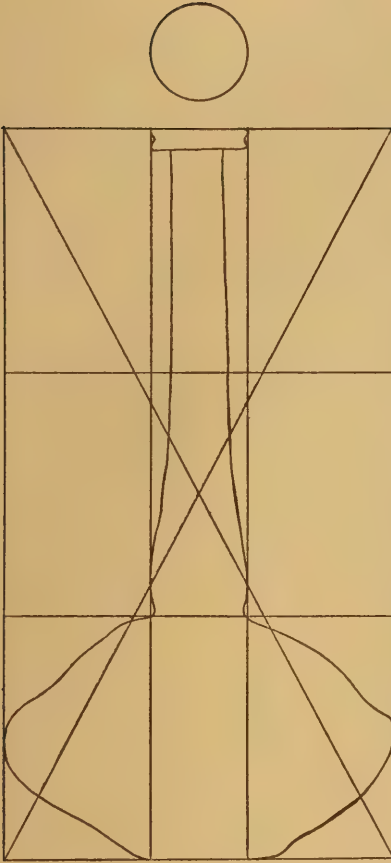


Fig. 92. Dynamic system, root-3 rectangle, last part of 1st century A.D.—Syrian oil flask.

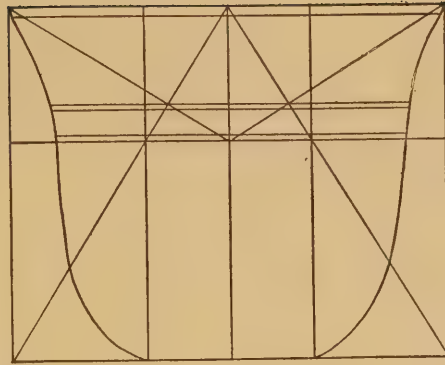


Fig. 93. Dynamic system, whirling-square rectangles.—Augustan era, 1st century B.C.

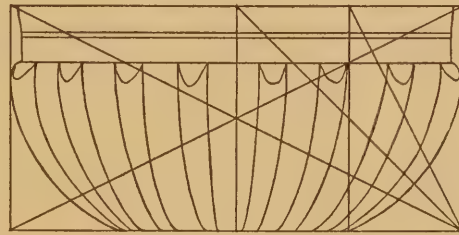


Fig. 96. Static system, two squares, 2d century A.D.—Lotus cup.

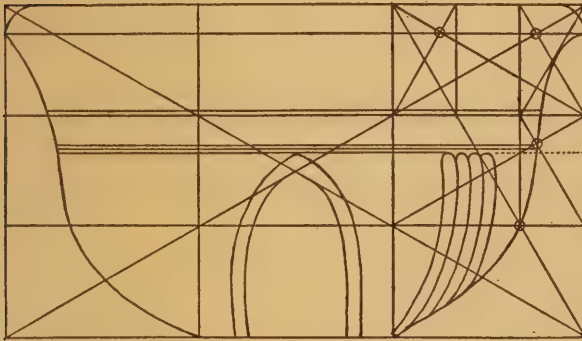


Fig. 94. Dynamic system, Syrian glass, end of 1st century B.C. to 1st A.D., a root-3 rectangle, with perfect agreement between vase and diagram.

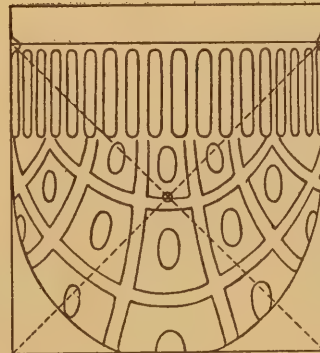


Fig. 95. Moulded Syrian vase, 2d century A.D., with little correspondence between details and the two upright root-3 rectangles.

MANNER OF USING THE DYNAMIC SYSTEM IN ARTISTIC CREATIONS. In using the dynamic system we first construct one of its rectangles, we will say a root-3, and divide it by producing a diagonal from each side. Against this diagonal we draw two perpendiculars or lines at right angles with it, and continue the lines until they reach the sides of the rectangle. By drawing perpendiculars from these points we divide the whole in three equal parts, each part being a root-3, and so on as far as we care to continue. The crossings of these lines can be used as guiding points in the construction of a vase, a decoration, or any other object. The result is that the details of the vessel, its corners, its decorations, its minute details, will all

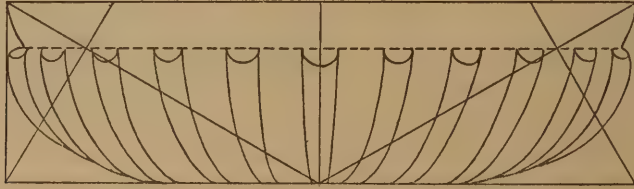


Fig. 97. Two root-3 rectangles.—Sidonian, patera or lotus cup, 1st century A. D. Perfect correspondence of line and diagram.

possess a certain harmonious relationship to each other and to the whole area, which can not be brought about by thumb rule. Another benefit, which must be clear and comprehensible to anyone who is not naturally (like the futurist) opposed to order and harmony, is that a series of vases, or decorations of vases, of the same exact form and proportions, can be constructed of different sizes by simply using different sizes of the same root rectangle. This can be done without the use of a single numeral.

An easy manner in which such areas might be used to advantage, is to produce diagonals and perpendiculars to the extent that at least two or three sizes or series of rectangles are created inside the original. By this manner a diagram with many crossings is created, each crossing being used as the point for a certain line or a certain decoration, as is best illustrated by viewing the diagrams appended.

For instance, if we wish to place a decoration of any kind in the center of, or in any other part of an area, or a vase, it will look harmonious if it possesses the same proportions as the whole.

HOW TO ANALYZE A MOULDED GLASS VESSEL. In order to determine whether or not a vessel of glass or any other material is based upon any certain system of symmetry, we must first analyze the vessel. We begin by measuring the height and width of the vessel with as great accuracy as possible and then construct an accurate outline drawing of the vessel in natural size or in absolute proportions if enlarged or diminished. The next step is to draw a horizontal line for the base, as wide as the greatest width, and another parallel line along the top. Next two perpendicular lines, one for each side. These lines, which should join and cross at

absolutely right angles, should form a rectangle in which each side acts as a tangent to the furthest projecting point of the top, the base and each side. The drawing of the vessel is then seen to have been enclosed in a rectangle as a frame for a picture. An error of one or two millimeters is often sufficient to confuse the analysis, so great accuracy is necessary.

From this point of the analysis we can proceed according to two different methods. One, the simpler for beginners, is to ascertain by means of a pair of compasses if this rectangle created is based upon any of the root rectangles already described, or upon a square or *even* fraction of a square. If based upon a square the artist made use of the static system; if a root rectangle, he may have based it upon the dynamic system. But unless we can also ascertain that the details of the vessel, such as its minor and inner outlines, its main decorations, etc., agree with the inner diagram of the dynamic system, we have no proofs that the vessel is actually based upon that system. The mere fact that the outer rectangle is a root rectangle proves little or nothing, as this coincidence might be accidental. This fact has been made use of by critics and others who claim that they can construct a dynamic rectangle around any object, a circumstance—by no means exactly put—which they make use of in their efforts to demonstrate to others, who know nothing of the subject, that the dynamic system is non-existent and fallacious. The deciding point is found in the inner diagram and its coincidence with the details of the vessel. If both the outer rectangle and the inner diagram coincide with the details of the vessel and its principal decorations, then we can be fairly well satisfied that such coincidences are intentional, and that a system was used.

In order to ascertain these possibilities we proceed to construct the inner diagram by drawing diagonals from each corner, and against these diagonals perpendiculars, that is, lines drawn from one or each angle crossing the diagonals at right angles. These perpendiculars are always extended until they meet the sides of the rectangle, the points of contact being used for dividing a root-2 rectangle into two equal parts, a root-3 into three equal parts, a whirling-square rectangle into a square and a whirling-square rectangle, as already described. If upon this we find that the nodes, or crossings of these various lines coincide with the outlines of the vessel or its main decorations, then we can be certain that the artist contemplated these coincidences when he constructed the vessel.

The process can be reversed when, instead of analyzing a vessel, we desire to construct one. In the latter case we simply produce a dynamic rectangle and its inner diagram on paper, and then use the nodes as guiding points in designing the vessel or decoration.

In this method no mathematics need to be used, only the compass and the square for producing lines at right angles, instruments known to the Egyptians and the Greeks, and to all other ancient peoples who produced artistic objects and designs.

MATHEMATICS AND THE DYNAMIC SYSTEM. The other method in constructing a root or dynamic rectangle is by means of mathematics. This system

was possibly known to the Greeks and the Egyptians, but as now known to us it is so simple that it can be used by any schoolboy who has mastered the principles of adding, dividing and multiplying. It can be of special advantage to architects and designers. Its use is based upon the well-known circumstance that the proportions of two straight lines of any size and meeting at right angles can be expressed in figures. If one side is twice as long as the other side, as for instance in a rectangle composed of two squares side by side, their relative form, as well as the form of the units to that of the whole area, can be expressed by 1:2, or simply 2, which means two squares. This type is also designated as root-4, in the dynamic system, but as "two squares" in the static system. The exact proportions of the sides to each other in the dynamic rectangles were ascertained by Hambidge, and the numerals designating their relationship were made use of by him, in the belief that every one had as great a talent for mathematics as he. The numerals which need to be memorized by any student, artist or architect who intends to make use of the system are few and simple. The side of the square, regardless of size, is always designated as "1". Except in rectangles which consist of an even number of squares, the proportion of one side to the other is immensurable, so that a continuous use of figures would never exactly express the proportion; but for all practical purposes, three figures will suffice. The following are the proportions of the sides in the first seven dynamic areas:

A square	1:1
A whirling-square	1:1.618
A root-2 rectangle	1:1.4142
A root-3 rectangle	1:1.732
A root-4 rectangle	2
A root-5 rectangle	1:2.236

In other words, if in a root-2 rectangle the shorter side is designated as 1000, the longer side contains 1,414.2 units; that is, it is 414 units longer. These are the numbers for the principal dynamic rectangles. There are others, made by combining squares with roots, and roots with whirling-squares, but as far as the writer's experience goes, no such rectangles have been discovered in antique glassware, and they are therefore outside the scope of this consideration.

The way to construct any dynamic rectangle when its proportions are known is quite simple if we make use of a ruler with subdivisions of tenths of inches, meters or yards. We simply erect a rectangle with, for instance, one side 1 inch high and the other 1.618, if we desire to erect a whirling-square rectangle; or 1:2.236 if a root-5 is required, and so forth.

CHRONOLOGICAL PERIODS OF GLASS-MAKING

The following groups or chronological periods suggest themselves as natural and simple. It must, however, be remembered that each period overlaps the one preceding as well as the one following. A sharp division is therefore not possible. These



Plate 17. The Auldjo cameo vase, from Pompeii, now in British Museum. 1st century B.C. to 1st century A.D.—*See page 157; Text Fig. 111.*



Plate 18. The cameo vase in the Cabinet de France, Bibliothèque Nationale, Paris. Augustan era. Top and base restored.—*See page 155-158, general.*



Plate 19. The Naples cameo amphora, found in Pompeii. 1st century B.C. to 1st century A.D. Front view, after W. Zahn.—*See page 157.*



Plate 20. The Naples cameo vase, found in Pompeii. 1st century B.C. to 1st century A.D.
One of the side views.—*See page 157.*



Plate 21. Corresponding details of the Naples cameo vase, center, and the Antioch chalice, sides, showing the close relationship of design, plan and arrangement of principal details and consequently of date.—*See page 157.*



Plate 22. The Campana beaker with overlaid and carved decorations. 1st century B.C. to 1st century A.D. Louvre. Below an Arretine bowl with related decorations of vine leaves. St. Louis (Mo.) Museum.—*See page 167.*

divisions into periods are based upon the material, the matrix, of which the glass was made. The technic is also considered and perhaps the best general characteristic of the periods previous to the discovery of glass-blowing from a bubble or a liquid mass of glass. Hand in hand with the technic came the form and proportions which naturally had to accommodate themselves to the material, the technic and the practical use for which the vessels or other objects were destined. The decoration and the colorations of the glass must also be taken into consideration.

The fact that certain forms were repeated in different periods does not invalidate these fundamental principles, because the glass vessels of one period could never be so well imitated as to defy research work, provided the student be well acquainted with the originals. Even with full knowledge of all the characteristics of a glass a perfect imitation would be a rare exception. A greater difficulty is produced by our finding glass secured through robberies of older tombs in which this is mixed with and reburied with later glass, as for instance in the Scandinavian and Lombard tombs which, though late, often contain objects made several hundred years earlier. But once these possibilities of error have been pointed out, no difficulty should be encountered in assigning to each glass its proper general period. Some antique glass is, however, undatable because the specimens were separated from the other finds before the date of the tomb was known, and sold to collectors who were fully satisfied by the assertion that the glass was antique.

THE PERIOD OF GLAZE. This period began in prehistoric Egypt and lasted to the middle of the second millennium B.C. During this period objects of glass were unknown, but objects made of stone and clay were covered with simple, generally yellowish or greenish, glaze. The duration of this period must have been two or three thousand years.

THE PERIOD OF CORE-WOUND GLASS. During this period, which began in the middle of the second millennium B.C., small objects were made of pad-glass, but vessels were generally produced by first shaping a core of sand, and by coating this core with glass threads softened by heat. This period continued for more than one thousand years, until the time of the Ptolemies, when new methods for making glass were invented.

THE PERIOD OF TUBE-BLOWN GLASS. As a period proper, it lasted but two hundred years from the middle Ptolemies to the time of Augustus. During this period vessels were made of pad-glass by first rolling up the pad into a tube, and subsequently enlarging the tube by blowing. The vessels made by this simple technic were small, but beautiful and delicate, beyond any made afterwards. During this period gold-glass was invented and perfected by enclosing gold leaf between two films or thin sheets of glass. Enamel, that is powdered glass mixed with oils, was first made in this period. During this period vessels were also made by joining tubes of different sizes, and closing the base with a glass pad.

THE PERIOD OF BUBBLE-GLASS OF AUGUSTUS AND TIBERIUS. This period comprises the whole or part of the 1st century B.C. and the greater part of the 1st A.D. During this period was invented the use of the blow pipe, whereby

glass could be blown and a vessel made from a drop or mass of fused glass. At the same time the use of composite glass rods was discovered. The rods were at first coated by dipping, but later were made by fusing together columnar rods of different colors so as to produce a pattern when cut off transversely. Another remarkable type of glass discovered was the cameo glass, which permitted of mouldings and carvings of marvelous beauty. A special quality of glass, now called ivory paste glass, was invented in this period but disappeared with it. The cities Sidon and Tyre were the headquarters of glass, but the art spread to Italy in the middle of the 1st century A.D. Moulded glass was much in use during this period.

EARLY ROMAN PERIOD OF BLOWN GLASS. This period begins somewhere in the end of the 1st century A.D. and continues to the time of Constantine in all its glory of delicacy and lightness, good size and simple form, with applied or ground decorations. But little moulded pad-glass was used; the bubble-blown, lighter and more transparent glass, being a comparative novelty, was more attractive. In the early part of the period classic forms were in favor, but in the end of the 2d and through the 3d century, Oriental types became models and extravagant disproportions crept in. Most of the glass found in Italian, French and German tombs belongs to this period.

THE CONSTANTINEAN AND EARLY CHRISTIAN PERIOD. The material and the technic, as well as the artistic quality in general, degenerated during this period so that already at the end of the 4th century A.D. the art of making uncolored transparent glass had been lost or was so rare as to be negligible. Still during this period a revival of old Egyptian forms took place, probably through finding glass in ancient tombs. But with all its poor glass matrix, its awkward forms, its crude technic and its vulgar and stiff decorations, this period produced the symbolic and religious glass which is most interesting and worthy of collecting and study. Glass with Christian symbols, glass reliquaries, glass amulets, arose and disappeared, and now constitute an everlasting source for study, enjoyment and admiration. The colors of this glass are dark and crude—brilliant blue, red, and green being scarce—with a peculiar sadness pervading every object made. But it is a sadness relieved by faith and hope and introduces us to the very thoughts of those who made and owned these objects created by earliest Christian enthusiasm. That principally the religious glass has been preserved is easily explained by the enthusiasm of religious thought which caused everything worthy of decoration to be decorated with religious symbols. This period is all the more interesting because its glass has never been studied by archæologists devoted to Christian art, and thus offers a wide new field for investigation.

THE BARBARIC OR MEDIEVAL PERIOD. Our knowledge of the glass of this period, which began somewhere in the 5th century A.D. and lasted until the advent of the Venetians about the 12th century, is mostly derived from Merovingian, Lombard, Gallic and barbaric tombs in general. The glass vessels might have been made in different places but the types are everywhere the same. Beautiful forms are nowhere seen, the glass is dark, the colors poor, except in the beads, in which the

new orange yellow is the most interesting. Crude red and yellow are the most common and many of the glass beads are dull brick-red with white stripes. A surprising number of barbaric glass beads were made during this period, but it seems probable that they came principally from Egypt, even though they are now found in Italian, Frankish, German and British tombs. The best specimens found in the tombs of this period were with certainty derived from robberies of more ancient tombs.

A new revival in the art of glass-making came through the Arabs and the Venetians.

THE ARABIC PERIOD OF GLASS. The Arabic period is well defined in its artistic qualities, but its chronology is uncertain and so too is the place where the best specimens originated. The Arabic conquest began in the 7th century and was practically over in the 8th. The fine Arabic glass as we know it to-day, begins in the 9th century, reached its perfection in the 14th century, and then suddenly degenerated. The common glass of the Arabs is practically unknown as it was not found to be important enough to be enclosed in the tombs. The only Arabic glass of which we possess more extensive knowledge is the enameled glass which began in the 9th century and practically ended, as far as its quality was concerned, with the 14th century. It is called Arabic because it has come down to us from ancient mosque treasures and because it contains Arabic, and Kufic, inscriptions. Schmoranz has shown that this glass was made, not in Egypt, but in Damascus, at times on account of special orders for the decoration of the mosques. The Arabic period is thus characterized by the rediscovery, by the Arabs or by the Venetians, of uncolored transparent glass, and by the perfecting of the use of colored enamels. The Arabic or Syrian artisans introduced lapis lazuli, and other mineral colors as pigment in the coloring of the glass. They perfected the use of gold enamel, made use of ornamental lettering, deriving this art and taste from the Syrians and the artisans of Mesopotamia, the Sassanians and the Persians. The Arabic glass was made known to Europe by the Moors in Spain, but especially by the Crusaders, who brought back with them many specimens which struck their fancy. The Crusades, however, ended before the best Arabic glass was made. Some of the so-called "Arabic" glass in our museums is in reality Sassanian.

HINDOO GLASS. On account of finds of antique glass in India, a tablet, datable, according to information given by A. K. Coomaraswamy, of Boston Museum of Fine Arts, to the 1st century B.C. to the 4th century A.D., some claim a high development of glass-making for that country at an early date. (*Arch. Serv. India*, Ann. Rep., 1919-1920, p. 24; 1920-1921; and 1923-1924, p. 115.) But the flask of stratified glass illustrated as a specimen is not Indian, but Sidonian, evidently imported. (See also: Marshall, *Guide to Taxila*, p. 57.)

PART III. CLASSIFICATION OF TYPES: EGYPTIAN PERIODS

CLASSIFICATION OF ANTIQUE GLASS TYPES

GLASS can be classified according to various principles, but like all artificial classifications none of these is perfect or generally applicable. For the general groupings we will follow the period system already mentioned. For the types and the regroupings of types, we will use the more detailed characteristics of technic, form, decorations and coloring, at the same time bearing in mind that, whereas modern glass is manufactured in innumerable places, each locality and each manufacturer trying to outdo his competitors, antique glass was produced in a comparatively few places which offered special facilities for procuring the proper sand and soda required for the matrix. Such favorable circumstances were at first combined especially along the Nile delta and about Sidon and Tyre, but as facilities for transport increased these original foci of glass manufacture lost some of their importance.

Kisa's divisions of classification are more detailed, but as they are not well defined and illustrated no one can follow them unless he could procure illustrations of every specimen Kisa had in his mind. As far as the writer knows and has experienced, much of the glass in our public museum and private collections is unclassified, and, unfortunately, arranged to impress the ingenuous public rather than the student. Much of it is arranged according to size, the result being to confuse the chronology even when indicated.

THE PERIOD OF GLAZE. The period of glaze commenced about one thousand years before the first Egyptian dynasty, several thousand years before glass was invented. Beads of pottery and stone glazed pale yellow, almost uncolored, were in use during the period of the first Egyptian burials, in Egyptian prehistoric times. Later the glaze became more distinctly green and dull blue, which during the IIIrd to the XIIth dynasties was improved, so that we find beads of stone and pottery from tombs of that period with rich green and fine brick-red glaze. In the XIIth to the XVIIIth dynasties, glaze reached a great perfection, both as regards brilliancy and softness, a combination of qualities never again equaled, and only rivaled with the advent of the Arabs. Much of the beauty of the early Egyptian glaze, as well as that of the Arabic, especially the green Arabic—Rakka—glaze, is due to the fact that the transparency of the glaze permitted the lower white matrix to reach the eye. A

corresponding effect was impossible in any other glass except in gold-glass, and in stratified glass, types which depend for their remarkable beauty upon the reflected light from the lower layers. Glaze was at first restricted to pottery and stone. Although in time glass beads and glass vessels replaced the pottery vessels and the pottery beads, it is doubtful if these innovations equaled the earlier ones in perfect beauty. At first the difference was not great, but as technic was perfected, the early simple beauty gave place to showiness.

FIRST EGYPTIAN PERIOD OF GLASS

THE PERIOD OF CORE-WOUND GLASS AND PAD-GLASS. The glass vessels during this period were produced by dipping shaped cores of sand into fused glass, or by winding threads and rods of glass around a sand core, shaped as a cup or flask. The sand was probably held together with gum, albumen or by some unrecognized substance which could be readily dissolved afterwards. The threads were later fused to adherence and finally the inner sand core was scraped away. Another technic consisted of using a pad of glass which could be moulded to shape. The surface of the vessels was decorated with threads of glass which in the better specimens were rolled into the surface. The pad was produced by pouring fused glass over a slab of marble, the matrix being either simple or a mixture of angular pieces of glass pressed together in the way of a "breccia," in which colored fragments of glass were mixed with fused uncolored glass.—Pls. 1-3.

The favorite decoration of this period consisted of colored glass threads or rods which, after being wound around the vessel, were dragged into patterns of garlands, arches, feathery columns, etc., a technic which was continued throughout history until our day.

The first objects made of glass were amulets and beads, the earliest dating from the XIth dynasty. So far no vessels of glass have been found to be older than the XVIIIth dynasty. The glass of this period, especially its early part, is characterized by its milkiness due to innumerable minute air bubbles which remained in the glass and gave it a pleasant softness, not shared by any later, more technically perfect, glass.

The glass beads of this period were plain or decorated with wound threads, with simple dots or bosses, or with stratified eyes, a technic which distinguished them from the Roman beads in which the eyes were produced from cut-off, compound rods of glass. The characteristic form of the glass beads of the early Egyptians was due to the technic of laying the rod over a bronze wire. Later cuff beads were made, like the pottery cuff and tube beads of the XIIth dynasty.

Until the 9th century pure uncolored transparent glass was unknown except perhaps in very minute quantities. But about that time beads made of glass almost optically perfect began to appear in Italian tombs, undoubtedly imported from Egypt or Syria. Vessels, however, were not made of such glass until the 1st century A.D. During this period, which lasted from the XIth dynasty to the early Ptolemies, tube-blown glass and bubble-blown glass were unknown. The result was

that the vessels are heavy and had to be ground to thinness on the potter's wheel, or by hand with emery powder. The vessels are consequently small, and only exceptionally of a size approaching the Roman vessels of the 1st century A.D.

TYPES OF GLASS VESSELS OF THE EGYPTIAN PERIOD. We can distinguish between two chronologically distinct series of glass vessels. The earlier, which characterize the XVIIIth dynasty, consisted of more open vessels, such as cups, urns, etc. The later vessels, characterizing the centuries immediately before the Ptolemies, were principally long and narrow balsamaria and amphorisks, the earliest dating perhaps from the 9th to the 8th century B.C. Small beautiful pitchers with handles are also known from these same tombs. Moulded and carved portrait heads of unsurpassed quality date to this period.—Pls. 1, 2; Figs. 98–103.



Figs. 98–103. Types of core-wound Egyptian vessels, XVIIIth and XIXth dynasties.

PAD-GLASS CUPS. Small cups made by pressing a sheet of pad-glass in a bowl-shaped mould. The rim is generally made by adding to its edge a twisted glass rod, a finishing used in most all glass vessels of the early Egyptian period. Innumerable



Figs. 104 and 105. Pad-glass objects of XVIIIth and XIXth dynasties.

fragments have been found, the most interesting collections being from the Palace of Amenhotep and Lisht. Discovered by the expeditions of the Metropolitan Museum. Mostly dragged patterns.—Fig. 104.

COLUMNAR BALSAMARIA. The form is that of a narrow column crowned by a lotus capital with petals in one or two rows. With or without a low foot-ring. The decoration plain or dragged ring threads. Base is generally rounded requiring a holder as support. Use: supposedly either for unguents or incense sticks.—Fig. 77.

COLUMNAR VASE

Mrs. W. H. Moore Collection. Pl. 3. Height 3.2"; diameter lip of rosette 1.3"; neck 0.6"; base 0.8".

Matrix dull opaque blue glass with characteristic dull grayish tint. Columnar, upwards tapering, capital rosette with eight petals, lotiform with central tube rim. Decorations: yellow glass thread lining of petals, a collar around the neck, and a double white thread around the base. The technic is doubtful, the surface being marked by microscopic striations from top to base, which might indicate that it was made of lump- or pad-glass with central bored cavity.

SECOND EGYPTIAN PERIOD OF GLASS

SECOND EGYPTIAN PERIOD. From 9th B.C. to the Ptolemies. The technic pad-glass and core-wound glass. The vessels are small, used for the toilet, and only occasionally large enough for household purposes. Balsam flasks and small flasks with handle and pinched lip spout. Matrix dull, blue, opaque white, brown, violet. Decorations, dragged threads, dull yellow, turquoise green, opaque white, etc. Very few form types. The matrix generally dull, opaque with innumerable bubbles. Neither tube-blown or bubble-blown glass in use. Perfectly pure uncolored glass appears in Italian tombs of the 8th century in the form of beads, this being the first occurrence of such glass known.—Pls. 4, 5; Figs. 106, 107.

THE SARGON VASE. Matrix dull uncolored, with the name "Saryukins" in cuneiform letters. Pad-glass or core-wound, finished by grinding. British Museum.—Fig. 106.

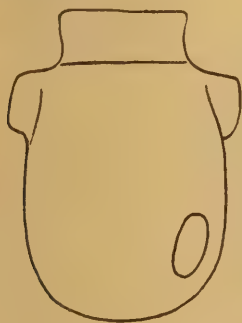


Fig. 106. The Sargon vase, pad-glass or core-wound.

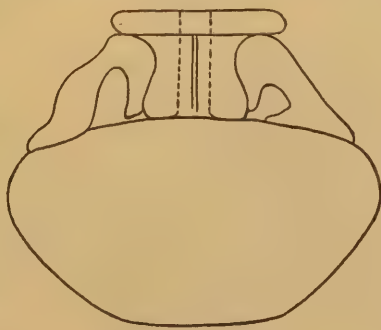


Fig. 107. Late Ptolemaic pad-glass vase, core-wound, Brooklyn Museum, N. Y.

COLUMNAR ALABASTRONS. Form cylindrical, columnar, rounded base, with two minute knob or loop handles, sometimes prolonged downwards on the side; mouth rim flat, circular, with small central bore without tube. Matrix dull, opaque

white, blue, violet, mostly with dragged threads of yellow, white or turquoise blue green. Very numerous from IXth to the Ptolemies. The body is generally tapering upwards, base rounded or even pointed. Mostly from Syria and Egypt.—Pl. 4.

ASSYRIAN GLASS FORMULÆ. According to R. C. Thompson, *On the Chemistry of the Ancient Assyrians*, London, 1925 (copied in *The Glass Industry*, New York, Nov., 1926, p. 264), a cylinder of the time of Assurbanipal (668-626 B.C.) contains twenty-seven different formulæ of glass composition. From this conclusions have been drawn that Assyria had attained a greater proficiency in this art than Egypt, at a much earlier date than Egypt. The Sargon vase, Fig. 106, however, is a clumsy, unartistic pad-glass object, and the incompleteness of the formulæ, and the repetitions of references to cooling the oven before inserting the glass mixtures show that the writer was a copyist, perhaps an Assyrian traveler in Egypt who had collected the formulæ for home use. Had Assyria made fine glass, Sargon would not have placed his name on one of the poorest.

ALABASTRON WITH YELLOW AND BLUE

Mrs. W. H. Moore Collection, 714. Height, 3"; diameter lip flange, 1.3"; neck, 0.7".

Matrix deep violet blue glass, with innumerable bubbles, core-spun technic. Plain and dragged thread pattern, ochre yellow and pale blue. The mouth flange was added after scraping out the core.—Pl. 4, *d, f*.

PEAR-SHAPED AMPHORISK. Small toilet vases made with core-wound technic, plain or with dragged pattern. Appear in Italian tombs about 800 B.C. Also found in Syria and Egypt. With or without handles.—Pl. 4, *a, b*.

AMPHORISK WITH HANDLES

Mrs. W. H. Moore Collection. Syrio-Egyptian. About 800 B.C. Height 3.33"; diameter, 1.9".—Pl. 4.

Matrix dull greenish blue, thick, heavy walls, decorated with chrome yellow and brick-red threads and bands in an irregular spiral from top to base.

MINIATURE WINE PITCHERS. These begin to appear in the early 8th century in Italian tombs. Many come from Syria, which seems to have been, together with Egypt, the place of manufacture. In elegance of form and careful technic these little core-wound pitchers are not equaled by any. Matrix generally blue with white, ochre yellow and turquoise green dragged decorations with closely set band.—Pl. 4, *c*.

OIL FLASKS WITH HANDLE AND BASE RING. The decorations resemble the fragments of glass found in the Palace of Amenhotep, and we can assume that the type occurred in the XVIIIth dynasty. The form is that of a pitcher with pointed but slightly pinched mouth. The decoration is dragged with upright feathery designs of great perfection.—Pl. 4, *e*.

MELON AND LOTUS BEADS. The most important, certainly the most interesting beads made of glass and pottery, in antiquity, are those known as melon



Plate 23. Fragments of moulded glass and cameo glass, mostly from the Bibliothèque Nationale, Paris, but some from the Metropolitan Museum.—*See pages 168, 331.*



Plate 24. Two moulded glass tiles, Victoria and Albert Museum, London. About $5\frac{3}{4}$ in. x $2\frac{3}{4}$ in.—*See page 168.*

beads, though they should with more propriety be called lotus beads. They are ribbed and possess the same form as a cantaloupe melon. In another place the author has already shown that they were originally, that is in the XVIIIth dynasty, derived from the lotus bud, the idea and symbolism perhaps going back to prehistoric times. A lotus bud in the form of a bead is in the Metropolitan Museum, dated to prehistoric Egyptian times, and it seems probable that this early type was connected with the later one in the time of Amenhotep.

CONICAL CHESSMEN. Chessmen made of lump- or pad-glass were in use since the XVIIth dynasty, and their use continued indefinitely. They can be more or less correctly dated from the quality of the glass, the Roman ones being generally made of pieces of left-over mosaic glass or waste. The form is more or less conical, but flatter specimens are also found. They must, however, not be confounded with the flat, circular, upper convex disks which were used in pairs, cemented to each other with a bore passing through the *cement*, as beads in a necklace. Some could also have been used as markers in games. One chessman in the Moore Collection measures: height, 1.1"; base, 0.7".—Figs. 105, 108.

BUTTON BEADS OF GLASS. These beads have the form of disks with a flat under surface and a convex upper one. They appeared in quantity in the 5th century B.C. in Etruscan tombs as well as in Egypt. They were used cemented together with the flat surfaces joining, the bore passing through the cement. The earliest button beads were plain, but they were soon decorated with threads and bands of glass, and with drops, bosses, etc. In the Augustan era they began to be made of mosaic glass. In the 4th century A.D. they were decorated with the Constantinean cross and drop symbols. So far none as yet found has been dated, or can be dated after the 5th century A.D. Kisa and others, even after the publication of my paper on Button Beads, continue to describe these beads as markers in playing games, which they can not be, because the under surface is never worn. Besides, two and two, in pairs of the same size, but of different colors, are nearly always found together in excavations, and generally in collections, which shows that they had some connection. Too, if these were markers we should not expect them to be scattered over the country. They are found not alone in tombs, but on the surface everywhere where no games could have been played, which shows that they were dropped through the parting of the cement supporting them in a necklace. The actual necklace illustrated in the author's article just quoted proves their nature. Their dates are determined, partly by their form, which was high and irregular at first; by their size, which was small before the 8th century B.C. and which grew as time advanced; by the decoration, which was absent in the oldest, simple in the 5th century B.C., made with mosaic pattern in the time of Augustus and with dragged patterns, but especially with Christian emblems, in the time of Constantine. Some with the Vision of Constantine are figured among the amulets in this monograph.—Pl. 129; Fig. 108.

PART IV. SIDONIAN PERIOD AND ITS TYPES

SIDONIAN PERIOD

SYRIO-PTOLEMÆAN PERIOD. 3d century B.C. to 1st century A.D. This period is mostly characterized by the Sidonian glass, mentioned by Pliny and other ancient writers, and identified by Kisa and others with certain forms found in Syria and to a lesser extent in Egypt.

The Sidonian glass, as we now understand it, comprises pad-glass, tubes, tube-blown glass, stratified glass, and bubble-blown glass, succeeding in the order mentioned. It is proper to distinguish between an early period and a late period, the latter including the reign of Augustus and Tiberius up to Nero. During this period tube-blown and bubble-blown and mosaic technics were invented. The glass matrix was perfected from sluggish to rapid flowing. The colors were improved. The matrix known as the ivory paste glass appears for the first time in the time of Augustus. The most admirable technic is that of stratified glass, which appeared and soon vanished with the increasing craving for size and transparency, two qualities which have proved the ruin of the ancient artistic glass. On account of the great perfection of the artistic quality of the glass in this period, some historical references to Sidon and its nearby cities may be of interest.

SIDON, THE QUEEN OF SYRIA. The city of Sidon was known to the ancients as "the Queen City," or as "The Great," already a thousand years before Rome, Antioch and Alexandria had become prominent. It was the mother city of innumerable colonies, scattered along the shores of the Mediterranean and the coast of the Atlantic. Its sailors traded with the south of Britain and had, so it is said, a famous temple at the northern end of their trade route, Avalon or Avallon, later one of the foci of the legends of the Holy Grail. Sidon became the center of arts and industry and especially was its manufacture of glass mentioned by the ancient writers. Its name, Sidon, is said to mean hunting, or a locality where wild animals could be hunted profitably, a suggestion made likely on account of the city of Ornithopolis—city of birds—in the immediate vicinity.

HISTORICAL HAPPENINGS. In ancient times, 1450 B.C., Sidon was a prominent city—at the time of the XVIIIth Egyptian dynasty, it furnished Egypt with vessels for a navy, and it was mentioned by Joshua, (x1:8) as "great Zidon." In 1290 it was destroyed by the Philistines, an event which caused the rise of Tyre. In 811-782, it was taken and held by Ramman-Nirari, the Assyrian, who made it

pay tribute. In 676, it was destroyed by Esarhaddon. In 570 it was taken by the Egyptian Ouaphres. In 535 conquered by Cyrus. In 480 it supplied Xerxes with ships against Greece. In 351 it joined the revolt against Artaxerxes Ochus but was betrayed by its king, Fennes. In 332 it submitted to Alexander. In 323, at the death of Alexander, it was given to Ptolemy and thus became joined to Egypt, partaking of its art and influence.

In modern times: In 1107 it was taken by the Crusaders; December 19, 1110, taken by Baldwin; in 1187 it was retaken by the Saracens; in 1197 retaken by the Christians; in 1229 it was given to Federico II, Roman emperor, who resided in Palermo, Sicily. In 1249 it was captured by the Saracens. In 1253 captured and destroyed by the Templars and again lost. In 1291 it was in the hands of the Templars but again taken and destroyed by the Saracens. Later it was taken by the French and lost by them to Djezzar in 1791. In 1837 greatly injured by an earthquake; in 1838 rebuilt by Soliman Pacha. In 1840, September 28, it was bombarded by the English, Austrians and Turks under Napier.

ORNITHOPOLIS. Below Sidon, but above or north of Tyre, lay a city called in ancient time Ornithopolis, meaning the city of birds. Much of the glass now called by us Sidonian is decorated with birds in various poses, sitting, flying, nesting. Many of the birds resemble storks and swans, a circumstance which suggests that this city was a center for the manufacture of glass in the time of Augustus and Tiberius.

THE SIDONIAN COLONIES. All writers of antiquity agree in their statements that the Sidonians founded colonies around the Mediterranean basin, almost from their earliest arrival on the coast of Syria, about or before 1200 B.C. Cyprus, Crete, Siphnos, Tharros, Tracia, Chalcis and Porto Eusino were said to have been colonies of the Sidonians in the near east, while further west were founded Carthage, Sicily, Sardinia, and Spain. They extended their voyages southward to the equator, and northward to the British Islands, or further. It is also said that a pot containing a hoard of Carthaginian coins has been found in a small volcanic crater on the Island of St. Michael of the Azores some little distance west of the present Ponta Delgada. The Greeks claimed that Cadmus, the founder of their nation, came from Sidon, but others hold that the Sidonian colonists of Crete at a later date returned and founded the Sidonian empire in the early part of the first millennium B.C. The general theory has been that the Sidonians acted as general distributors for the glassware made by the Egyptians and that they themselves did not manufacture the ware carried by themselves to distant parts of the then known world. This theory cannot, however, be sustained.

THE SIDONIAN GLASS. From the theory that the Phœnicians and Sidonians acted as distributors of the ancient glass instead of having been the actual manufacturers, we should expect to find Phœnician glass in the tombs of Britain and the north of Europe. This is not the case. The earliest ancient glass found in the north of Europe is glass that was brought there by returning vikings, by soldiers who had been in the employ of the Roman emperors, and finally by the emigrants during the

Great Migrations. Of early Sidonian glass, such as we know it now, there is no trace in the north. This proves that glass was not traded to any extent by the Sidonians, and that the later glass found in the north was brought there by others. The majority of the ancient glass found in Scandinavia dates to the 3d to 4th centuries, the earliest having been derived from the robbery of ancient tombs during the Migrations period. There is said to be much Phœnician glass in the museum of Cagliari, Sardinia, but photographs recently received from the director of that museum prove that but a few of the specimens are core-wound glass, while the great majority are 1st century glass types also found in Pompeii. Not one single specimen of such typical Phœnician glasses as the stratified and the moulded ivory paste glass is among the photographs sent me, which were said to include all important types. The same types were sent me from the Public Museum in Tripoli, Tripolitanea, Africa. This, it seems, disproves the existence of a widespread glass trade among the Phœnicians.

The Sidonian glass comprises the manufactures of the late Ptolemies and those of the reigns of Augustus and Tiberius, with a slight revival in the 2nd century A.D., the latter poor.

THE SIDONIAN TECHNIC. According to the Sidonian technic we can distinguish between the following types: pad-glass; tube-blown glass; bubble-blown; blown in a mould glass; moulded pad-glass; stratified glass, pads and tubes; mosaic columnar rod-glass; gold-glass. Moulded glass occupied the most prominent place in the later part of the period, depending upon Hellenistic designs.

THE SIDONIAN MATRIX. The glass matrix consisted at first of plain pad-glass; later stratified glass of various colors; the invention of the columnar rod; the ivory paste glass, the bubble-blown glass. Clear transparent glass was rarely used on account of its inferior artistic qualities; opaque glass, however, predominated.

THE MATRIX COLORS. The characteristic colors of the Sidonian glass are deep blue, in transparent matrix, opaque, white ivory paste blue-gray, pale yellow; brilliant transparent emerald green; natural violet, brownish yellow and cherry red.

SIZE OF THE VESSELS. The size of the vessels was small, none being large enough to serve as household objects. The majority were made for toilet use and for religious rites in connection with the lares and penates in the home.

IMITATIONS OF PRECIOUS STONES. Pliny (*Historia Naturalis*, XXXVI) states that the Sidonians imitated precious stones. They probably also invented the grinding of glass so as to give a crystalline form to their imitations. The modern complicated faceting of stones was, however, not known. The simple pyramidal form is the most common in Sidonian beads.

THE SIDONIAN DECORATIONS. The Sidonian glass is generally decorated by the means of mouldings with inimitable, smiling, happy faun and Pan heads. Others are decorated with temple vessels, objects of the arena, laurel leaves and wreaths, Greek themes of acanthus and anthemion, unsurpassed in simplicity and naturally graceful charm. Even grotesque heads and faces were designed and moulded in glass, but always with a dignity not seen in the Roman caricatures. In order to

fully understand the nature of the Sidonian decorations we must remember that the art of glass-blowing from a bubble had then been only recently discovered, and their technic had not yet reached the point where vessels could be blown of sufficient size to be used as household utensils. The artisans had therefore to depend upon delicacy, harmony and color for the attractiveness of their ware, in which they were pre-eminently successful. Their glass, even in modern times, has not yet been equaled, much less surpassed.

THE CHIEF DECORATIVE TYPES

HUMAN FIGURES. The human figures, including deities, were represented full length in relief, always designed with Hellenistic proportions and in Hellenistic style. They include nymphs, bacchantes, fauns, etc., as well as heroes.—Pls. 46-48.

PLANT REPRESENTATIONS. These include fruits of various kinds, especially grape bunches, pine cones, pomegranates, all sacred in the religious rites. They are used singly, a favorite place being between columns under arches, alternating with other objects. We also have life symbols such as Trees of Life.—Pl. 52.

WREATHS. The wreaths are generally made of laurel branches with a horizontal position. Leaves alternate with berries on stalks, ivy sprays with star-shaped leaves; palm leaves are common but placed upright and used as division marks between areas, especially to cover the mould ridges. Leaf sprays, mostly on Cyprus glass, are used in more or less the same way. There too, we find trefoils and braided leaves in bands probably used as protection against the evils of magic.—Pl. 60.



Fig. 108. Chessmen and button beads.—5th century B.C., *a*, *c*—time of Constantine, *d*, *e*—about 1st century B.C., *f*, *g*—showing the manner in which the button beads were cemented together.

PROCESSIONAL AND TEMPLE OBJECTS. The most conspicuous moulded decorations of Sidonian vessels consist of representations of actual vases placed under arches and between columns, just as we would assume that they stood in the temples to Bacchus and Astarte in Sidon. They are confined to a few types of flasks, and are always repeated in the same order. This strengthens the theory that they represent actual temple treasures, such as could have been seen in the sacred processions or could have been found in temple niches. They are closely connected with the processionals.—Fig. 114.

PROCESSIONALS. They consist of representations of jewel boxes, amulet boxes, sacrificial plates, crossing torches and a few other objects not yet identified. They too, were perhaps carried in the sacred processions, and were familiar objects to the spectators.—Fig. 118.

OBJECTS OF THE GAMES AND ARENA. Strigils, disci, oil vases, prize vases, laurel wreaths with bands.—Fig. 120.

SYMMETRIC PATTERN. Perhaps purely decorative, including cross-hatched fields, anthemias, spiral curls, scrolls, sprays, shields and rosettes. It should be noted that martial objects are lacking. This is in accord with the well-known peaceful and religious sentiment of the Phœnician people.—Pl. 54.

CHRONOLOGY AND TYPES OF THE SIDONIAN PERIOD

Without defining either the beginning or the end of the Sidonian period, which naturally overlaps the one before and the one which followed after, we can distinguish three minor sub-periods which compassed the 1st century B.C. and the 1st century A.D.

THE EARLY SIDONIAN PERIOD. Pad-glass alone. Tube-blown glass. Tube-blown stratified glass. Ptolemæan glass.

THE MIDDLE SIDONIAN PERIOD. Bubble-blown in a mould. Mosaic glass. Ennion and other signed vessels.

LATE SIDONIAN OR EARLY ROMAN. Flat pressed bowls, cups and plates. Innumerable minor flasks, tubes and toilet articles of poor glass and poor technic. The end of this period might be considered as having comprised the end of the 1st century A.D. and the first years of the reign of Hadrian in the 2d century A.D.

TABLE OF THE EARLY SERIES OF SIDONIAN GLASS

THE PAD-GLASS SERIES. Plain, pressed, tube-blown, moulded, cameo cut, mosaic, rod pads.

Chessmen, button beads, markers. Fig. 108.

Gold-glass with gilt reliefs. Pl. 6.

Plain pressed pad-glass cups and bowls. Pl. 7.

Plain glass urns. Cinerary urns Augustan era to 2d century. Pl. 9.

Plain pad-glass urns with stratified decorations. Pl. 11. For comparison:

Pl. 43, *e*.

Pad-glass cylinder sections. Pls. 10, 12.

Pad-glass urns with enameled designs. Color Plate II.

Pad-glass urns with gutta and granulations. Pl. 14.

Plain pad-glass with horizontal handles. Pl. 15. Including open work. For comparison: Maara, Pl. 186; Silver cups, Pl. 187.

Cameo pad-glass. Pls. 16–21.

Intaglio in glass. Pl. 23.

Carved plain glass. Lycurgus beaker, etc. Text Fig. 111.

Mosaic pad-glass. Pls. 26–35.

Rod pad-glass. Pl. 29.

Overlaid pad-glass. Pl. 22, *a*.

Patella cups of pad-glass, pressed in a mould. Pls. 29–32.

Spherical patella with bands. Pl. 37.

Patera, lotus cups. Pl. 39.

TUBE-BLOWN PAD-GLASS BOTTLES.

Plain tube-blown. Pl. 42.

Stratified tube-blown bottles. Pls. 42-43.

Stratified strips and rods. Tubes not blown or slightly blown. Pl. 44 *b*.

BUBBLE-BLOWN IN A MOULD WITH RELIEFS.

Three-sided flasks with mythological figures. Pls. 46, 47.

Beakers with mythological figures. Pls. 48, 49.

Sidonian Temple series, with temple vessels. Pl. 50.

Flasks with processional reliefs. Pl. 51.

Flasks with palestra objects and symbols. Pl. 52.

The Argonaut series. Pl. 53.

Flasks with geometrical and scroll patterns. Pl. 54.

Flasks with basket designs. Pl. 55.

Six-sided flasks with scrolls and waves. Pl. 81.

Ennion and other signed vessels. Pl. 56.

Cylinders with Jewish symbols or objects. Pl. 58.

Cylinders and flasks with victory symbols and objects. Pl. 60.

Pilgrim flasks. Pl. 53.

Beakers with moulded designs. Pl. 59.

Chalices. Pl. 62. For comparison: Boscoreale cups. Pl. 62.

BUBBLE-BLOWN WITHOUT RELIEFS.

Ampulla flasks, plain or with spiral threads.

Ampulla flasks with gutta decorations. Pl. 68.

Paper thin, blown vessels. Beakers and jars. Pl. 69.

AUXILIARY OBJECTS FOR STUDY. The Sidonian glass can only be understood by a comparison with other objects made at the same time. These comprise objects of pottery and silver. The principal ones are the following, which form with the Sidonian glass a compact, chronological and artistic group.

TERRA SIGILLATA. Vessels made of pottery, glazed red or green, more rarely black. They are so named because they are generally stamped with the names of the makers or with their seals. They were made on the Grecian Islands, the first known having been excavated on Samos. The best known come from the ancient Arretium, now Arezzo. The poorer qualities come from Gaul and Germany, Spain and Hungary. None seems to have been earlier than the 1st century B.C. and the best quality ended with the 1st A.D.

GREEN-GLAZED SYRIAN OR MAARA POTTERY. These cups and urns are closely related to the silver vases of the Hildesheim and Boscoreale finds and to the Varpelev and Hermitage "opus interrasile" cups.

THE HILDESHEIM AND BOSCOREALE CUPS which either resemble the two-handled low, green-glazed Maara vases, or the higher, ovoid shaped Berthouville vases found in France.

THE TANAGRA STATUETTES. Some figures, which evidently represent goddesses or local protectresses, but made of glass, are with certainty related to the Tanagra pottery or terra-cotta figures.

HELLENISTIC MARBLE SCULPTURES. The remarkably interesting circumstance that the Double Herm vase, with two female heads, possesses a sister replica in Greek marble indicates the origin of this type as Sidonian glass vessels. All these types will be represented by some specimens in the latter part of this volume.

THE ANTIOCH CHALICE. This wonderful vessel possesses some relatives in glass of the 1st century A.D. and its decorations are intimately related to moulded decorations found on glass and pottery of this period.—Pl. 21.

RELIEFS ON COINS. The vases of certain types could not be understood in their relationship to each other and to vessels of other material unless considered in connection with the reliefs on Greek and Jewish coins.

PTOLEMÆAN AND SIDONIAN GOLD-GLASS

There is a great difference between the artistic quality of the earliest gold-glass and that of the later period. The earliest, or Ptolemæan, gold-glass contains several distinct technical types characterized by a layer of gold film or leaf between two layers of glass.

GOLD-GLASS BEADS. From the tombs of Meroe and other places in Egypt, made by gilding a tube of glass and passing it into a larger tube. The tubes were then cut to size and the ends closed by fusing. Many specimens are in the Metropolitan Museum, but the most remarkable from the Meroe tombs are now in the Antiquarium of Munich.

SCRATCHED GRAFFITI. Mentioned by Kisa, p. 838. The decorations consist of acanthus, winged amorines, etc., now in the British Museum.

GOLD-GLASS RELIEFS. From an existing relief in metal or marble a mould was made in clay. From this mould a glass relief was made. After gilding the relief the whole was covered with a sheet or film of glass. Later the edges were fused to adherence.—Pl. 6.

THE NUPTIALS OF AMOR AND PSYCHE. The specimen is part of a bowl of blue glass, about 7 inches in diameter. The figures are raised and covered with gold leaf, fissured by expansion. Amor, winged, is standing by Psyche, who in her left raised hand holds a wreath with which to crown her lover; between them is an altar, in the form of a tripod of Hellenistic style. Once in the Niessen Collection.

EARLY PAD-GLASS BOWL CUPS

Plain cups and bowls produced by pressing a pad in a mould or by forming them by hand. The truncated sphere is the most common form. All the earliest drinking cups of glass were made in this technic, but minute toilet cups were also produced. Some of the cups were large enough to invert over a jug so as to keep out the dust. The same technic was used in producing mosaic pad-glass cups.—Pl. 7.



Plate 25. Intaglios and one moulded relief of glass, 1st century B.C. to 2d century A.D.
Mrs. W. H. Moore Collection.—*See pages 168, 332.*

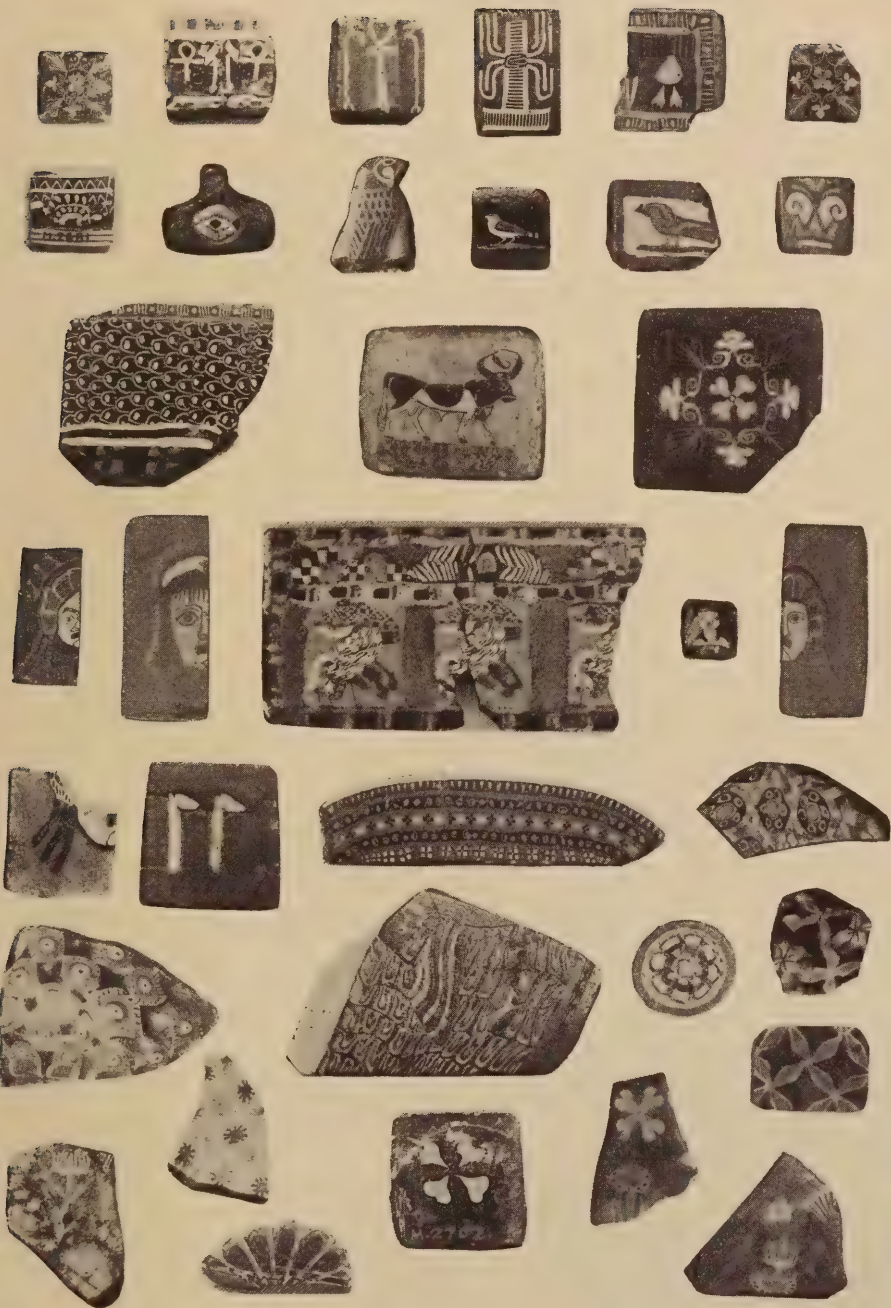


Plate 26. Fragments of columnar mosaic glass, Egyptian types. The Metropolitan Museum and the Freer Collection, National Museum, Washington, D. C.—See page 193.



Plate 27. Columnar mosaic glass tile, seemingly a portrait of an oriental personage. Egypt.
Once in the Gans, now in Mrs. W. H. Moore Collection.—*See page 197.*

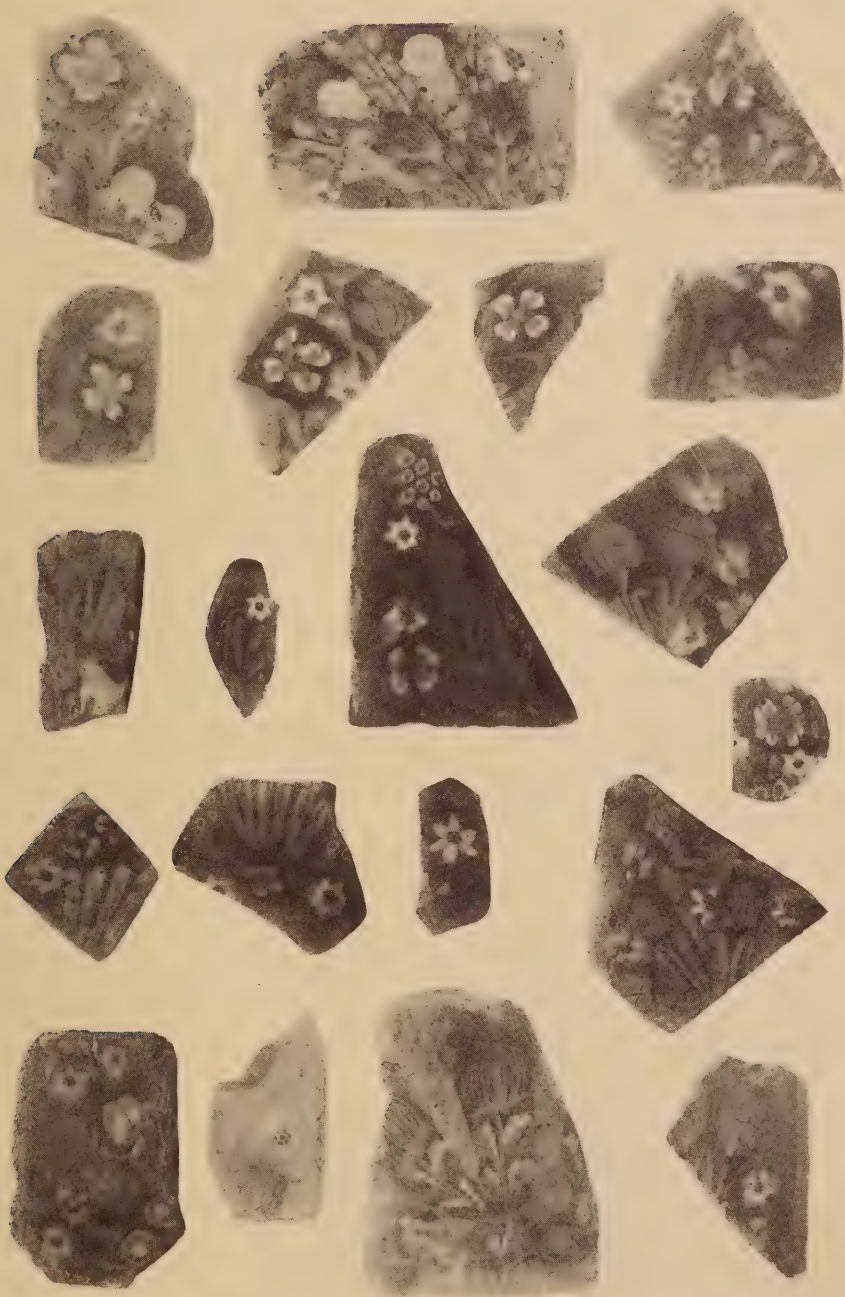


Plate 28. Fragments of rectangular mosaic glass tiles, Egyptian types, laurel sprays, poppy heads, various flowers. Arthur B. Davies Collection. Augustan era.—*See page 197.*



Plate 29. Cups of columnar mosaic glass, white rods in violet matrix. 1st century B.C. to 1st century A.D. Syrian. Mrs. W. H. Moore Collection, *b*; Metropolitan Museum, *a, c*. 1st century B.C. to 1st century A.D.—*See page 197.*



Plate 30. Mosaic glass plates, 1st century B.C. to 1st century A.D. Mrs. W. H. Moore Collection, *a*; Ed. B. Moore Collection, Metropolitan Museum, *b*. The latter with four representations of necklaces in the triangular fields.—*See page 197.*

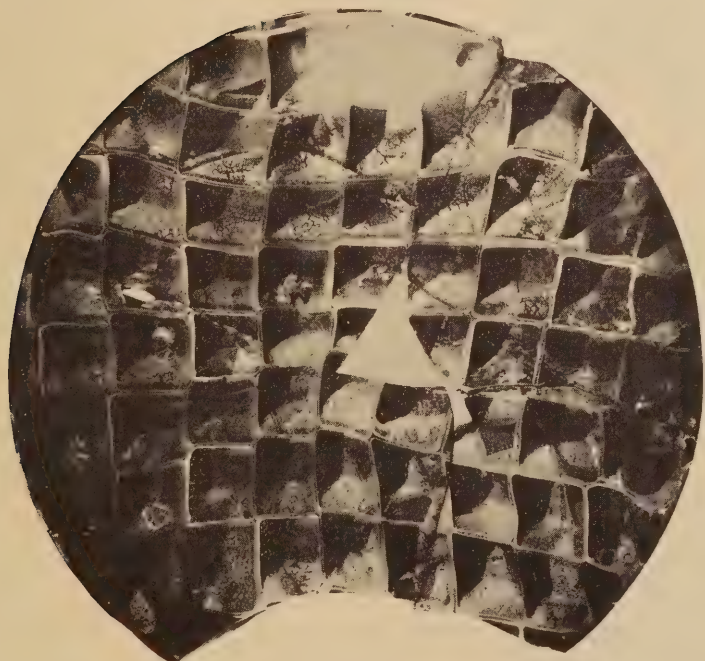
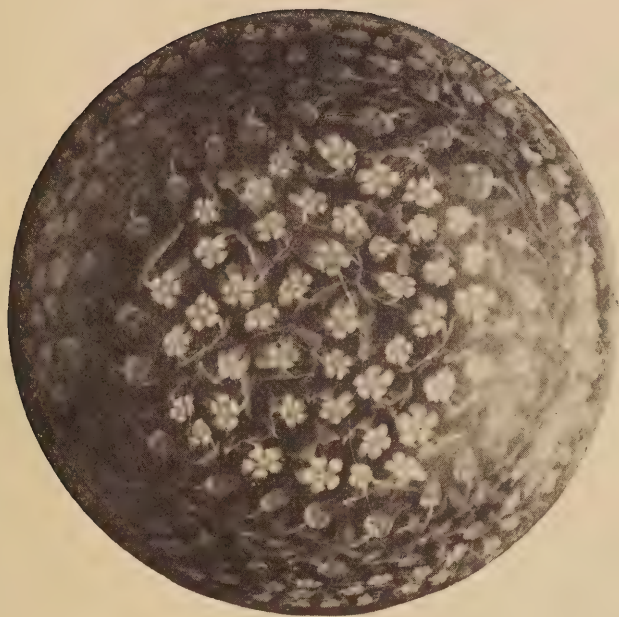


Plate 31. Columnar mosaic glass plates. Neues Museum, Berlin, white, red and green in blue matrix, after photograph by Mr. Fritz Treu, *a*; The Phebe A. Hearst plate, University Museum, Philadelphia, brick red, turquoise green, pale yellow, *b*, 1st century B.C. to 1st century A.D.—See page 193.



Plate 32. Patella and patera bowls of mosaic glass, columnar scrolls. Augustan era. Upper and lower, Metropolitan Museum; central patera lotus cup, Mrs. W. H. Moore Collection.—*See page 198.*

After the 1st century A.D. the pad-glass cups were succeeded by blown-glass cups. For convenience' sake, two cups of minute size, possibly blown-glass, are included in this group.

SIDONIAN GLASS CUP

Height, 2.4"; diameters: rim, 4.4"; base, 3.8". Mrs. W. H. Moore Collection, 656. Pl. 8. Violet manganese glass. Cylindrical sides, with flat base as wide as the rim. Two inner ground-out concentric rings produced by a lathe.

TRUNCATE SPHERICAL BOWL CUP

Height, 1.3", diameter of rim, 2.7". Mrs. W. H. Moore Collection, 688.—Pl. 7.—The bowl is truncate spherical with contracted outline above the base. Metallic violet luster oxidation.

JARS AND CUPS MOULDED AND GROUND TO FORM. The 1st century is rich in its exquisite blue or pure uncolored cups and jars, formed in a mould and then ground down and polished, and often decorated with a few concentric lines. The form of the cups, which is similar to those with gutta drops, assists to date these types with certainty. The color is mostly a fine deep blue, like that in the two pad-glass urns with granulated and mottled decorations.—Pl. 8.

SIDONIAN BOWL CUP

Height, 1.45"; diameter, 1.7"; base shoulder, 1.8"; base, 1.1". Mrs. W. H. Moore Collection, 651. Transparent uncolored glass of greenish tint, approaching the cylinder form, with narrower mouth than bulge. This and similar cups seem to have been made of pad-glass pressed in a mould and afterwards ground to smoothness and finish. Their delicacy of color and form is marked and characteristic of the 1st century.—Pl. 8, *b*.



Fig. 109. 1st century A.D. vessels with foot-base moulded in one with the body.—Stratified glass, Mrs. W. H. Moore Collection, *a*—Sangiorgi Collection, *b*—blue glass, *c*—Sidonian, *d*, *e*—early 2d century A.D., *f*.

THE BASE OF MOULDED AND PAD-GLASS TUBE-BLOWN FLASKS. But few pad-glass flasks of the early Augustan and Tiberian eras have been preserved, but all those we know of are of exquisite form, color and general appearance. Their most conspicuous characteristic lies in the foot which is in one with the body, a mere contraction of the lower part of the original tube and later body proper. Such bases

are also found in the stratified flasks, in the bubble-blown and moulded (Pl. 47). Temple series of flasks, in some of the flasks with double Bacchus faces. It is also found in the superb yellow flask with applied head in relief under the handle which is the gem of the Giorgio Sangiorgi Collection in Rome, and of which there is a splendid colored reproduction in his monograph. The pad-glass foot in one with the body is common in the 1st and 2d century moulded glass but rare after that. The latest observed by the author date from the end of the 2d century; after that an added base ring came in use.—Fig. 109.

HEAVY PAD-GLASS VASES—PLAIN OR WITH DECORATIONS OF THE AUGUSTAN ERA

This group is partly contemporary with that of the stratified pad-glass group. The vases were made by forming sheets in tubes or by pressing a sheet of such glass in a mould as in the stratified group. Two or more such units were joined by fusing or cementing.

The decorations were painted on the surface or made by drops of glass or granules of glass sprinkled over the surface, fused and rolled in. The cameo vases belong naturally to this group, as they too are mostly made of pad-glass. They were commonly found in tombs of the 1st century B.C. to the time of the destruction of Pompeii in 79 A.D. After that time they were replaced by blown glass. Ground decorations in the form of sunk disks and ovals also occur at this time. The same forms are found in Arretine pottery, Roman silver, crystal ware, plain glass and amber.—Pls. 9–14.

FRUIT, OIL AND CINERARY URNS. A considerable number of urns with more or less pointed covers have been found in the tombs of Gaul, Germany, central Europe, Italy and Spain. A few come from Syria and Egypt. They were used for various purposes both as household utensils and as cinerary urns. Some found in Italy contained the remnants of fruit and oil, others coming from the columbaria contained ashes of the dead. The earliest seem to date from the 1st century B.C., the latest from the middle of the 3d century, when cremation was superseded by burial in large sarcophagi.

The urns are of several distinct forms, Kisa classifying six or more.

DOLIUM URNS. Spherical body, or body approaching the spherical, with or without handle, generally with pointed cover. The earliest are hand-formed, the later are blown. The forms were derived from the more ancient water jar or hydra. The most remarkable of all the urns of this type is the one in the Metropolitan Museum, made of violet brown matrix with stratified glass decorations.—Pl. 11.

CRATERS OR CRATER URNS. More or less spherical body, gradually contracted downwards. Handles confined to the shoulder.

AMPHORA, of the same general form but with the loop handles connecting the shoulder and the mouth rim.—Pl. 10.

CYLINDERS with cover, mostly from Gaul and Britain.

STAMNIUM FORMS. Cylinders with a handle resembling flasks, or jugs and jars.

PRISMATIC VASES. With four or six sides.

The 1st century urns differ, according to Kisa, from those of later date in that the neck is very low. The 2d century urns have more elongated neck and larger handles, like those of the amphora, between shoulder and lip rim.

PAD-GLASS VASES WITH STRATIFIED DECORATION (*Augustan era.*)

This type has until now been described and labeled as "band glass." The pattern was not, however, produced by permitting bands of opaque glass to dissolve or be incorporated in a plain matrix, but by causing strips of stratified glass to fuse partially in the already formed pad-glass vase, thereby placing these vessels close to the stratified glass series. The most splendid specimen of this type is the large cinerary urn in the Metropolitan Museum, said to have been found near Turin, Italy. Small cantharus and lotus cups with a similar decoration are not uncommon. In some of the smaller specimens the strips were first folded zigzag, or the whole body was made up of a single strip of such stratified glass. The characteristic mulberry-like grape clusters on this vase are also found on green glazed Syrian pottery, a specimen of which is reproduced on Pls. 11, 188.

TUBE-BLOWN PAD-GLASS FLASK WITH ENAMELED FIGURES

Mrs. W. H. Moore Collection. Ptolemaic. Pl. 12. Height 4.1"; of neck and mouth, 1.6"; body, 2.4". Diameter: mouth, 1.83"; neck, 1"; body, 3.1". Syria.

Olive-green matrix. Made of three or four different tube sections cemented together: the base, the body, the neck, and the mouth. The body was finished after fusing by grinding the surface.

The decorations consist of enamel applied with the brush depicting the following scenes from left to right:

A man seated, holding in his closed hands a round ball over a turntable in the act of fashioning a vase. Above the table a funnel-shaped beaker without handle, with concave tapering body and a vase with truncate pear-shaped body and wide funnel-shaped neck. A wide jar stands before the table.

A man seated, tending the fire in a furnace oven, at the top flames. A potter's oven.

A man and a boy filling a cylindrical oven with pottery. Above are hieroglyphs.

Two men standing facing each other arguing. Behind one are three perpendicular glyphs in a row.

A man with bent body kneading soft clay. A crescent-shaped tray-stand at the feet of the man. Above a row of glyphs.

PAD-GLASS FLASK WITH TWO HANDLES. Several specimens of this type are in the Gorga and Brooklyn Museum collections. Made of greenish heavy tube-glass, generally in three units: body, neck and mouth cemented together. The handles are also heavy. The narrow central opening was produced by pushing a rod through the body. The one figured here is based on two parallel root-3 rectangles, placed side by side, but no great correspondence in detail.—Fig. 107.

CRATERS, SCYPHUS URNS, CARCHESIUM URNS. Old Greek forms, once made of pottery and metal, were in the time of Augustus made of pad-glass, hand-formed or pressed in a mould. Craters were mixing bowls for table or household use. The scyphus was a vase with or without foot-stand but always with a flat horizontal handle. The carchesium vase possesses a lower spherical or wide bulging body and an upper part with inwardly curved sides. They seem to have been a favorite type for libation and temple rites, some having been reproduced in paintings and reliefs representing processions, rites, sacrifices and festivities.—Pl. 13.

CRATER VASE WITH ENAMELED DECORATIONS

Height, whole, 5.35"; foot and stem, 1.3"; diameters: bulge, 4.6"; top, 5.65"; base, 2.8"; stem, 1.05". Mrs. W. H. Moore Collection.—Pl. II. Colored. Deep blue pad-glass. The body was pressed in a mould and the stem and foot added. A crater form without handles. The decorations on the foot contain gutta drops of opaque white and yellow; those on the body proper consist of a wreath of painted enameled technic. The design is made up of two half wreaths or sprays tied together with a cord. We see leaves of laurel, myrtle and olive with a few berries and stalks. A flaked palm-leaf girdle around the base, a plain horizontal line and a row of short dashes below the rim, all painted in green, yellow and opaque white, now oxidized. Syria. A unique specimen of unsurpassed quality.

CRATER URN WITH HANDLES AND STAND

Gutta Drop Decorations

Height, 3.7"; diameter, 3.7". Mrs. W. H. Moore Collection. Matrix blue glass formed in a mould, and decorated with red and white gutta drops.—Pl. 14.

The form is that of a crater of small decorative size. A low but heavy foot, a rounded base of the bowl, which has inwardly-swung sides, and two ear handles on top of the shoulder.



Fig. 110. Scyphus cups, Augustan era.—The Varpelev interrasil, *a*—cut and ground crystal, Terme Museum, Rome, *b*—Arthur B. Davies Collection, *c*—Maara pottery, *d*—Syria.

SCYPHUS CUPS WITH OR WITHOUT FOOT-RING. Semi-globular with the handles in line with the upper rim. The handles are flat, with a lower ring and an upper thumb-guard. The form is common especially in Maara, Syrian pottery, in the Boscoreale silver, etc. The Varpelev opus interrasil cup belongs here and stands close to the Augustus cup. Pl. 190. Mrs. W. H. Moore pottery cup with Parthian

warriors, the Metropolitan Museum blue glass cup and the Arthur B. Davies cup are of this type. A similar cup form does not occur after the 1st century A.D.—Pl. 15; Text Fig. 110.

OVERLAID GLASS

Kisa, and after him German writers on glass, use the name “Ueberfangsglas” and “Ueberfangstechnik” for a series of glass types which are neither technically related nor chronologically connected. In order to avoid any confusion, we prefer to separate the types under distinct names: stratified glass, cameo glass and double glass, with the following characteristics of each:

STRATIFIED GLASS is composed of superposed sheets of glass of different colors fused to adherence. It was only used in strips cut from the edge of the pad in order to show the different layers on the surface of the vessel, or strips were used as decorations on other glass.

CAMEO GLASS. The glass pad is made up of two or three sheets, the uppermost being opaque. When used, the opaque upper layer was cut to design and the rest cut away in order to expose the lower layer as a background. Ordinary cameo glass. Sometimes the design was moulded, and the white layer made from threads.

DOUBLE GLASS. Two sheets of different glass, yellow and green, blue and green, etc., were fused to adherence. In this manner a vessel could be interiorly of one color and exteriorly of another color. This type has no relationship with the double-colored, red and green glass of the Augustan era (Lycurgus vase).

CAMEO GLASS AND OTHER CARVED DECORATIONS

In the 1st century B.C. the Greek cameo carving in hard stone was partially rivaled by the carving of cameo glass. It is generally assumed that the technic consisted of covering a vase of dark glass with a layer of opaque white glass, then cutting the latter to a pattern and removing the white glass between the design, thus permitting the dark colored glass to act as a background. Such a technic, however, would have been intricate and costly, and the fact that those few specimens which have come down to us were made up of a series of more or less modified cylinders suggests that the method was at times somewhat different. The first step was probably to produce a mould with an intaglio representing the design in all its details. Into this mould, of several parts probably, was pressed a pad of opaque white glass which was carefully thinned out between the designs. Back of this white layer with its relief was fused a pad of colored glass, and later on was added another upper pad to serve as a neck and a lower pad to act as a base. The last step in the process was to finish the figures with the carving tool, at the same time removing the thin opaque film which covered the spaces between the figures. This technic was with certainty used in creating the numerous lion and Medusa heads which we find applied to antique glass vessels of the 1st to the 4th centuries A.D. The same technic was used in pottery, especially in the Maara vases in Syria. Some of the

finest cameo glass has been found in Pompeii but this does not imply that it was made shortly before the destruction of the city. The time of Augustus seems more likely than the latter part of the 1st century A.D.

The use of moulds was probably also resorted to in producing glass carving of monochrome glass. We will probably find in time that some of the cameo glass carvings were copied from hard stone cameos by means of moulds, a technic which would be quick and cheap, qualities much appreciated in the 1st century A.D.

THE MOORE CAMEO VASE

With Mænad and Faun. Hellenistic, 1st Century B.C.

Said to have been excavated on the Villa Albani near Rome by Carlo Marchione when he constructed that palace for Cardinal Alessandro Albani, in 1760. It later was in the collection of Baron Wladimir von Grüneisen, representative of the Imperial Archeological Institute Nicholas II, Florence; the Fahim Kouchakji Collection in 1925; now in the Mrs. W. H. Moore Collection.

Height 7.5". Pl. I. Matrix deep blue with pearly opaque white cameo layer. The form is oblong pear-shaped with slender neck and somewhat funnel-shaped mouth part. The decorations are in four distinct parts, or bands separated by opaque white horizontal thread borders. Above, immediately below the mouth a wreath or horizontal grapevine scroll in naturalistic design. Next below this, occupying the rest of the neck, two Hellenistic anthemias consisting of a spread palm leaf surrounded by the outlines of a heart-shaped leaf with inwardly turned base spirals. The main decoration which occupies the body proper of the vase contains but two figures, one on each side. One a tripping mænad sounding the flute; the other a dancing faun holding in his right hand a thyrsus staff resting on the shoulder, and in his left hand a long wreath. On the sides between the figures are anthemias with outwardly swung base spirals. The lower carved band along the base contains a simple wreath of laurel leaves with the leaf pointing towards the right. The design and technical execution of the figures are masterly, and superior to either the Portland or the Naples vase. The technic is light, airy, graceful and shaded, with the draperies graduated into the blue matrix. The subject represented was a favorite one in the Alexandrian reliefs of marble (Hauser, *Die Neu-Attischen Reliefs*, pp. 84, 136). The figure of the dancing faun is similar to the one sculptured on the famous Borghese vase in the Louvre but superior in design. The Moore vase is one of the three found perfect and intact and can be considered as the greatest masterpiece in antique cameo work until now discovered. See also *Art Classique*, by Baron W. von Grüneisen. Galerie M. Bing, Paris, 1925.

THE PORTLAND TWO-HANDLED VASE. This vase is generally described as an amphora because it possesses two handles, but it does not resemble the Greek vases of that name. It is a moulded and formed pad-glass vase made up of at least three separate parts, as can be seen by the minute nicks on the neck of the flask. It was found in the 16th century and owes its perfect preservation to the circum-

stance that it was hidden in a sarcophagus and had never been directly exposed to the soil. It was found at Monte del Grano, three miles outside of Porta S. Giovanni, Rome. For one hundred and fifty years it was in the Barberini Collection but later was sold to Gavin Hamilton, who in 1786 presented it to the British Museum. In 1848 a crazy or drunken sailor smashed the object, but it was carefully mended by means of transparent balsam and appears as when found. The opaque layer varies between a mere film and a 5-millimeter thick layer. (Compare Kisa, *Das Glas*, pp. 179-183, Pl. VII, Text Figs. 188, 189.)—Pl. 16.

THE FROEHNER CAMEO VASE. This vase derives its name from the well-known archæologist, W. Froehner, once director of the Louvre Museum, who was the first to describe it. It originally belonged to Sambon, in Paris, but was bought by J. P. Morgan.

THE CASTELLANI MEDUSA HEAD. Deep blue pad-glass matrix with pale blue, opaque upper layer, carved to represent a Medusa head. One of the most artistic carvings of this type known. Found in Italy. In the Castellani Collection, Rome.

THE AULDJO PITCHER FROM POMPEII. It is important to notice that the three best specimens of 1st century A.D. cameo glass possess special features, not found in later objects, which resemble the corresponding ones of the Antioch chalice. These have to do with the form of the vine leaves, lotus buds, vine tyings, vine loops and the approaching knees of the vines. The Auldjo vase or oil pitcher was found in the Casa di Goethe when excavated in 1834 and is now in the British Museum. It contains doves, grape leaves, bunches, lotus buds, vine tendrils, etc. The spacing and general division between decorations and background is the same as in the Antioch chalice. Kisa, p. 584; Minutoli, p. 3, III; de la Motte; Froehner, p. 85.—Pl. 17; Fig. 111.

THE POMPEIAN TRULLA. Kisa, Fig. 191. Decorated interiorly and exteriorly with opaque white masks, grape and oak leaves, vine tyings, etc., of which our illustration copied from Kisa, Fig. 191, gives a fair idea. The matrix is deep blue, almost black. A pad-glass vase about 30 centimeters high.—Text Fig. 111.

THE NAPLES CAMEO AMPHORA. One of the most artistic objects known, decorated with opaque white designs on deep blue matrix. The design contains four distinct views, placed opposite each other, two and two being practically of the same type. On two sides we see amorines harvesting grapes, playing, making wine, etc., but on the front and back grapevines with approaching knees as on the Antioch chalice. The correspondence between the chalice and the amphora is further increased by the fact that the vine node is covered in both, in the chalice by an eagle and basket, on the amphora by a theatrical mask. A further correspondence concerns the rectangular space in the vine loop, which in the amphora is occupied by four rosettes arranged in a rectangle, the corresponding area in the chalice being occupied by the figure of Christ, also occupying a rectangular area.—Pls. 19-21.

THE TORRITA BALSAM BOTTLE has the form of an amphora with pointed base but without handles. It contains finely carved Bacchic scenes. It was

excavated near the railroad station at Torrita, in Val di Chiana, in 1870, and is now in the Museum of Florence. The lady celebrant holds in her hand a cantharus in appearance absolutely similar to the Hermitage vase which latter must be of the same date, and not of the 3d century as supposed. (Lovatelli, *Atti della r. Acad. dei Lincei*, 1884, vol. 13.)

THE CAMEO TILE OF SCAURUS. Held by Kisa as the most beautiful of the glass cameos, but its decorations are not well known (Kisa, Fig. 193), nor is the place of origin authenticated. Its carvings represent Apollo and the Muses as statues standing under arches, as in the temple series.

THE LIBBEY-TOLEDO VASE. A somewhat fragmentary vase in the style of the Naples vase with pale blue matrix and opaque white cameo carvings, superior in design and execution to the Portland and Naples vases. Supposed to have been



Fig. 111. Augustan era. The Hermitage silver and glass cantharus—the Pompeian trulla—the Auldjo cameo vase—the Lycurgus carved glass goblets. After Kisa, with permission of Karl W. Hiersemann & Co.

collected in Italy. The most entire figure is a dancing faun with a cymbal. Now in the Toledo Museum, to which it came with the Curtis Collection donated by Mr. Libbey.

THE LYCURGUS BEAKER. Found in Italy, now in the Rothschild Collection in London, but lately mislaid (Kisa, p. 612). Froehner describes it as one of the most remarkable pieces of antique glass known. Kisa errs in dating it to the 3d or 4th century, a time when such matrix was unknown. The figures resemble those of Arretine and Maara pottery of the 1st century, to which the glass matrix also belongs. The vase is carved out of a thick glass which is green in reflected light and ruby red in transmitted light. A fragment of such glass is in the Castellani



Plate 33. Cups of mosaic glass, columnar rods, *a*; lamellated sections, *b*, South Kensington Museum; stratified bands and strips, Metropolitan Museum, *c*. Augustan era.—
See pages 193, 198.



Plate 34. Plates of lamellated mosaic glass. Lamellated, short sections, *a*, Victoria and Albert Museum, London; bands and rods, *b*. Augustan era.—See pages 193, 198.



Plate 35. Cups of rounded or flattened rods. Trina rods. Mrs. W. H. Moore Collection, *a*; Metropolitan Museum, *b*; Fahim Kouchakji Collection, *c*; Metropolitan Museum, made of trina rods, *d*.—See pages 198, 207.



Plate 36. Patella cups of moulded and ground pad-glass, ivory paste, opaque white and cherry red, mosaic glass. Augustan era. Mrs. W. H. Moore Collection, *a-d, g, h*; Metropolitan Museum, *e, f*. Syrian.—See page 209.

Collection from the find outside of Porta del Popolo, and this was of the 1st century B.C. Other fragments of this glass came also from tombs of the Augustan era, one now in the Vatican Museum. Our representation is reproduced from Kisa with permission of Karl W. Hiersemann, the publisher (Froehner, p. 90: *Michaelis, Annali del'Inst.* 1845, p. 114; 1872, p. 257; Nesbit, Cat., p. 13), Fig. 113. Once exhibited in the South Kensington Museum.—Text Fig. 111.

INTAGLIOS IN GLASS MATRIX OF THE AUGUSTAN ERA. Glass intaglios, mostly on small circular disks about one inch in diameter, were quite common in the Augustan era, but they are mostly so oxidized as to make a study of the design difficult. Augusto Castellani showed the writer many hundreds found in a receptacle excavated on Monte Mario, in Rome, but so decayed as to be of little artistic value. Their technic was the same as that of intaglios in hard stone. Well preserved specimens are extremely rare. They mostly represent heads and bust portraits.

THE CAMPANA CAMEO BEAKER WITH GRAPEVINE GARLAND. Now in the Louvre, from the Campana Collection made in Italy. The form of the beaker is not egg-shaped as figured (Kisa, Fig. 112), but with flat base and cone-like shape. Nor is the beaker datable to the 3d century (Kisa, 475), but to the time of Augustus, and its technic is not "barbotine," but made in cameo style. This much can be decided from the study of a good photograph. The technic was begun by the making of a concave mould from a carved cone. The mould was about one-fourth shorter than the beaker, as the mark where it ended is plainly seen near the base, a little below the lowest decorations. The decorations were made by pressing colored glass in the decorated part of the mould, and afterwards finishing the beaker with blown, or perhaps with pad-glass. The following details show conclusively that the decorations could not have been made by barbotine. The leaves are sharply outlined; the berries are graded, the smallest being at the apex; the concentric rings of the lower disks are geometrically true; the upper disks or rosettes possess sharply defined partitions. The streamers which issue from the lower rosettes are quite regular as if carved, and could not have been made in any other way. The beaker is nearest related to the Auldjo vase and the Pompeian trulla in the Naples Museum, and must have been made in the same technic.—Pl. 22.

GRÆCO-HELLENISTIC INTAGLIO IN GLASS

Mrs. W. H. Moore Collection, 1st century, B.C., 0.8" high by 7.1" wide. A female head carved in glass in the style of a carved gem. Judging from the hairdress this specimen belongs to the Ptolemaic period, not later than the 1st century B.C. It is carved in Hellenistic style. The hair is dressed in five semicircular waves covering part of the forehead. Below the last one of these is seen a bunch of grapes. The hair is crossed by a band and covered with a veil, lifted at the back by a comb into three crests or peaks, which hang down over the right shoulder. The dress over the bust is folded and creased and comes down over each shoulder, meeting in the center of

the breast. Over the lady's left shoulder is seen a square broche. In front of it descends a tress of hair ending on the shoulder.

Cut in uncolored pure glass. The most beautiful specimen of the art of this period the writer has seen.—Pls. 23, 25.

INTAGLIO IN DEEP-GREEN GLASS

Height, 1.1". Mrs. W. H. Moore Collection. Intaglio, representing a female face with straight profile and simply dressed hair. A very good work not later than Augustus.—Pl. 25.

DOUBLE HEADS BACK TO BACK

Size of the blue, 0.9"; the green one, 0.7".

Blue glass, represents a priestess with long descending curls. The one in green glass represents a high priest. Both could be of the 1st or 2d century B.C. The priest's head is especially fine. Each contains the remains of an eyelet indicating they were pendants in necklaces. Syrio-Greek art.—Pl. 25.

PLAIN TABLETS AND PLATES

GLASS TABLETS AND WINDOW PANES. Plain, moulded and even mosaic glass tablets seem to have been in common use in the Augustan era as decorations of walls and other flat surfaces. Ancient writers tell that Scaurus, 58 A.D., used tablets of glass for the walls of his theater (Kisa, p. 393). The walls in the theater of Marcellus in Rome were also decorated with glass tablets. The emperor Commodus (180–192) is said to have covered the walls in the atrium of the Palatine palace with plates of a substance called "fengites" which reflected the images of those who passed. Search was made for fragments when the hall was excavated, but the excavator, Professor Boni, failed to find even the smallest fragment.

Pad-glass plates for windows have been found in Pompeii and in Ostia. These plates were made of thick glass, but the surface was not smooth and could never have been sufficiently transparent to permit anything but diffused light to pass through. The writer saw a glass plate 1½ feet wide being excavated in Ostia, but such large sizes are rare. Glass plates for windows have also been found in the basilica of Junius Bassus on the Esquiline. This building, however, seems to have been of the 4th century A.D. when window glass must have been found in all better houses. In Pompeii small window panes of glass are yet in place. But as windows in antiquity did not have the same purpose as in our day, these crude and uneven glasses served only for transmitting light. They were not blown but made by pouring fused glass over a marble slab, thinning it out by rolling.

PLATES, SAUCERS, TRAYS AND DISHES. Flat dishes made of pad-glass seem to have been common in the Augustan era, perhaps more as a curiosity than

for practical use. So far no dating of forms is possible on account of lack of references to the finds. They were common in Pompeii.—Fig. 47.

PLATES WITH HORIZONTAL HANDLES. The handles form a crest at two opposite ends of the plate or dish rim, extending horizontally in the plane of the lip of which it forms a part. Such dishes can be dated on account of their similarity to pottery dishes of the same type described by Hoenen, Pl. XVI, F. 105, Oswald and Pryce, Pl. 57.

One plate of silver of this type is in the Morgan Collection. The type persisted from the Augustan era until the first half of the 2d century A.D.—Figs. 22, 23.

PART V. MURRHINA AND ITS IDENTIFICATION

MURRHINA

ACCORDING to Pliny, vessels made of murrhina were first introduced to Rome 61 B.C., by Pompey the Great. Evidently already in Pliny's time opinions differed as to the nature of this substance, and he therefore set to work describing it in as careful a manner as he could. His description of murrhina is the only one which has come down to us, and unfortunately most translators of Pliny had no knowledge of the objects made in the early Roman empire, or they translated in such fashion as to make the matter conform to a preconceived theory. Unable to devote the space necessary to a full discussion of the subject, the writer is obliged to present a condensed summary of an essay prepared by him several years ago, and as yet unpublished.

The first to discuss this subject in modern times was Cardanus, who, in 1550, suggested that murrhina was identical with Chinese porcelain. In 1791, murrhina was identified by Von Veltheim as Chinese jade. Claude de Rosière was the first, in 1803, to connect murrhina with fluor spar. Ten years later, his opinion was sustained by Thiersch, who added that the mineral fluor spar was imitated by the Romans in glass. This opinion was also held by Mariette, who believed that the imitations were made in porcelain. In recent years Berthold Laufer once more identifies murrhina with porcelain, but most museums, private collectors, and especially Italian dealers, follow Kisa in claiming the identity of murrhina with mosaic glass.

In a general way it can be said that Pliny's description shows that murrhina possessed the properties of a mineral, and not the properties of glass. This is upheld by the wording in *Periplus*, Chapters 6 and 58, in which we read: "Malva in India, whence onyx-like and murrhina stones are brought to the port of Barygaza on the west coast."

The origin of the name, as well as its spelling, is disputed. It is written with or without "h," with "y," or with "u." The most likely derivation is from the gum myrrh (Latin *myrrab*, Greek *μύρρα*, Arabic *murr*), given on account of its aromatic odor, which resembled myrrh, and which gave the wine a highly appreciated flavor. The gum myrrh was similarly used by the ancients for flavoring wine, and to this day it is used as a flavoring or condiment for food in Syria and the Near East generally. Fluor spar possesses a similar odor.

Anton Kisa, the most profound student of antique glass, devoted forty odd pages

(*Das Glas*) in trying to prove that the ancient murrhina as described by Pliny and as mentioned by some of the poets, must be considered identical with the mosaic glass of the earliest Roman emperors. In fact he counted it one of his greatest achievements and life work to have finally and forever placed the much discussed murrhina vessels "where they belong." In order to accomplish this to his own, and to many others' satisfaction, he employed the same process of argument and conclusion as used by some archæologists in our day to prove or disprove others' opinions. He mentioned every possible argument which could be cited as favorable to proving murrhina being glass, but avoided according any importance to facts which showed that murrhina could not possibly have been that substance. We have no space to quote in full Pliny's description, which unfortunately is incorrectly translated in certain detail in our textbooks; but the following condensed account contains the important points:

Pliny, *Historia Naturalis*, XXX, 2. Murrhina is a mineral, derived from the earth, of great fragility.

XXXVI, 67 ff. Manufacturers made glass in imitation of murrhina, hyacinths and sapphires, and every other tint. Transparent glass was more valued than colored glass. Glass does not stand heat, and in order to be fused must first be pulverized.

XXXVII, 7. Murrhina was introduced by Pompey dedicating the vessels to Jupiter Capitolinus. But some were released and became owned by private persons. One vessel was sold for 70 talents (350,000 francs, old value) although it hardly held three pints. Consul Annius was so fond of his murrhina cup that he gnawed the edge, which enhanced its value. Nero held an exhibition of numerous confiscated objects, among which were murrhina vases, in his private theater on the Tiber. A tremendous crowd went to see them. A broken bowl was exhibited in a glass case or on a deep glass tray. The Consul Petronius broke his murrhina "trulla," worth 300 talents, so that it should not fall into the hands of Nero, but the latter at once bought another for 300 talents so as not to be outdone by a subject. (One talent = \$1,100.)

XXXVII, 8. The Orient was the home of murrhina, especially Parthia and Carmania. It is solidified by heat under ground. In size the pieces never exceed a small tray and in bulk rarely equal a drinking cup. It lacks strength and it possesses a luster rather than splendor (color). Its value lies in a diversity of colors and design concentrically spreading, one after the other, and in blotches of purple and white. And also in a third color issuing from the two like flashes of fire. The tints are a transition from purple to white. "There are those who mostly praise the margins and that buffeting of colors which one sees in the rainbow." Some are pleased with the dense blotches, transparency and paleness being defects. So also granules and warts; not prominent ones, but sessile ones, as often found in the human body. "Besides, its odor is favorably commented upon."

XXXVII, 11. And these three substances, amber, glass and murrhina hold the same rank, no doubt, as precious stones, the two former for the reason that crystal (glass) is adapted for cold drinks and murrhina vessels for either hot or cold.

Summarizing the description given by Pliny, we find the following characteristics pertaining to murrhina:

1. It was first introduced to Rome in the 1st century B.C.
2. It came from various places, especially from Parthia and Carmania on the Persian Gulf.
3. These places were remarkable for nothing else.
4. It was found as a mineral under the ground.
5. There were several varieties.
6. It was costly.
7. It occurred only in small pieces.
8. The Consul gnawed the edge.
9. This did not lower its value.
10. It was so rare that Nero caused an exhibit to be held.
11. The principal colors were purple and white.
12. The third consisted of flashes of fire as in the rainbow.
13. Some kinds contained nodules, warts, etc.
14. The darker varieties were the best, lighter ones were less valuable.
15. It possessed an agreeable odor.
16. It was suitable to hot drinks.
17. The vessel broken by Petronius was a "trulla" of murrhina (a round flat dish with a handle, for collecting or holding the crumbs or the drops of water poured over the hands of the diners). The cup purchased by Nero was a sacrificial vessel, a *caspiis*.
18. The price of the best murrhina lay between 70 and 300 talents.
19. Murrhina had the same general nature as crystals, amber and precious stones.
20. The units of the murrhina matrix contained or were arranged in concentric rings (*subinde circumagentibus*) or spreading one after or beyond the other.

Too much space would be required to take up each one of these points separately and compare them with corresponding qualities in mosaic glass of the types figured by Kisa, and which he terms "murrina." All interested may do that for themselves. If they do they will naturally notice that hardly one single point can be referred to mosaic glass, especially the odor and the iridescence of the rainbow fire. No one could chew glass, but someone could chew the edge of a vase of a soft mineral. No glass possessed iridescence when made—that was added by time as the result of decay. There are several minerals of the fluor spar group which possess the odor of tar, an odor or taste which is yet so highly appreciated by the Greeks and other Orientals, that they actually add pitch or wood tar to the wine jars before filling them with wine.

Besides by Pliny, murrhina is also mentioned by Propertius, Martial, Julius Capitolinus, Juvenal, Lampridius, Lucanus, Pausanias (Ch. VIII, 18, 5), Seneca, Sidonius Apollinaris, Arrianus, Cassius, Vopiscus, Statius, Suetonius, Ulpianus, Atheneus, Agricola, and perhaps others. From these stray references we learn that murrhina was yet in favor in the time of Domitian while, according to Kisa, mosaic glass (murrhina)

had ceased to be made in the time of Nero, hence the great price of the older vessels. Heliogabalus used murrhina vessels for vile purposes, but as mosaic-glass vessels were not in use at his time, his murrhina could not have been mosaic glass. Murrhina could be used for hot drinks, but glass, according to Pliny, was so brittle that it could only be used for cold drinks. Efforts have also been made to show that murrhina was identical with Chinese pottery or porcelain. Murrhina could not be mosaic glass because such glass was common. Murrhina was rare. Murrhina had taste, odor and iridescence, qualities which no one can claim for mosaic glass. But few types of mosaic glass possess concentric rings, and those which do clearly imitate a mineral, like onyx, sardonyx, fluor spar, marble. Glass was brittle, but murrhina was tough. Glass is made in many colors, but murrhina was only violet brown and white. Murrhina was therefore a mineral.

The poet Martial mentions "myrrhina" or "murra" many times. From his words we can establish the following characteristics, none of which is applicable to mosaic glass, but which are characteristic of a natural mineral. Murrhina was yet in high favor in the time of Domitian and Heliogabalus. It gave an additional high, desirable flavor to wine, like that of pitch (so much in favor among the Greeks in ancient times as well as now). It possessed a structural pattern of spots or nodules, or blotches. It was not fragile like glass and crystal. It was advocated for hot drinks. Martial seems to connect the name of *myrrhina* with that of *murra* or *myrra*, the only connection being that of its odor. Murrhina was, then, tough like a hard gum, not brittle like glass. Papias, about 60 A.D. to 135 A.D., and thus contemporary with Pliny, directly connects murrhina with myrrh, writing: "murrhiana is a wine flavored with myrrha." Pausanias connects "morrhia" with stone.

Finally, it must be noticed that Carmania was a desert country famous for minerals, but not for artistic objects, and so far not one single piece of mosaic glass has ever been found there. Murrhina was therefore a natural mineral, and not an artificial, highly artistic and complicated glass. This theory is supported by the statement that murrhina was imitated. The only imitations of a natural substance found in the excavations is the veined, white and violet "onyx glass" which probably was intended to represent murrhina.

We may go yet a step further in our argument and visualize the vessels made of murrhina mentioned by Pliny. If we do, we will find that all types possess a handle, or two handles. Mosaic glass, on account of its fragile nature, was never made with handles. None of the thousands of specimens of mosaic glass excavated possesses, or possessed, a handle.

PART VI. MOSAIC GLASS; CHARACTERISTICS, CLASSIFICATION, AND TYPES

THE MOSAIC PAD-GLASS SERIES

FOR reasons given in our earlier pages, the word "murrhina" is discarded as a name for mosaic glass, and the old denomination of "mosaic glass" is retained. The series began with the invention of the columnar rod in the time of Pompey or Augustus, and remained in fashion until the middle of the 1st century A.D. The finer types of mosaic glass vases can, however, be dated to the 1st century B.C. With the invention of the blowing of glass from a bubble, and with the perfecting of the technic in the time of Pliny, the finer, more expensive and beautiful glasses were supplanted by the thinner, more transparent glasses of the new technic. The blown glass also supplanted the use of silver and bronze vessels of the poorer classes, and even the rich and powerful became enamored of blown glass. According to Kisa, mosaic glass vessels had all but disappeared in the time of Nero and were never again resurrected. Mosaic glass has been found in later tombs, especially in the middle and north of Europe, but all such specimens must have come from robberies of more ancient tombs.

The place of manufacture of the mosaic glass so freely found in Syria, Italy, Gaul and elsewhere is yet under dispute. Certain types were certainly made in Syria, probably in Tyre and Sidon; some come with certainty from Egypt, and others perhaps were actually made in Rome. Still, so far, no factory of mosaic glass has been discovered, and until one is found all is uncertain. In the time of Winkelmann, in the middle of the last century, a large hoard of mosaic glass fragments was found on Isola Farnese not far from Veii, near Rome. Another hoard was found outside of Porta del Popolo, both attributed to factory sites, but without proof. It is more probable that these were remains of accidentally broken mosaic vessels respectively in two shops, as no entire vessel seems to have been discovered. The fragments reached thousands in number and seem to have fallen in the hands of one dealer, who assorted them and furnished each with a frame of gilt paper or cardboard. The fragments were then made up in sets or collections of from one hundred and fifty to three hundred, more or less, and sold to collectors and museums. The result is that such framed specimens are now seen in many museums and in many collections. Could these fragments be collected and pieced together, it is not improbable that



Plate 37. Ribbed, banded and moulded spherical cups. Augustan era. Mrs. W. H. Moore Collection, *a*, ivory paste glass; the rest, Metropolitan Museum.—*See page 211.*



Plate 38. Stemmed bowl with navel cup, lined with opaque white glass. Said to come from Egypt. Date uncertain. Mrs. W. H. Moore Collection.—*See page 212.*



Plate 39. Ptolemaic lotus cups of silver. Egyptian Collection, Metropolitan Museum, *a-d*; lotus cup of glass, Syrian, 1st century A.D.—*See page 212.*



Plate 40. Lotus patera cups with moulded ribs. Low types, 1st century A.D. Pompeii and Syria. Metropolitan Museum.—*See page 213.*



Plate 41. Lotus patera bowls, high types, 1st to 2d century A.D. Italy and Syria. Metropolitan Museum.—See page 212; *Text Fig. 113, f.*



Plate 42. Tube-blown and stratified glass. Mostly from Mrs. W. H. Moore Collection. 1st century B.C.—See pages 214, 227, 228.

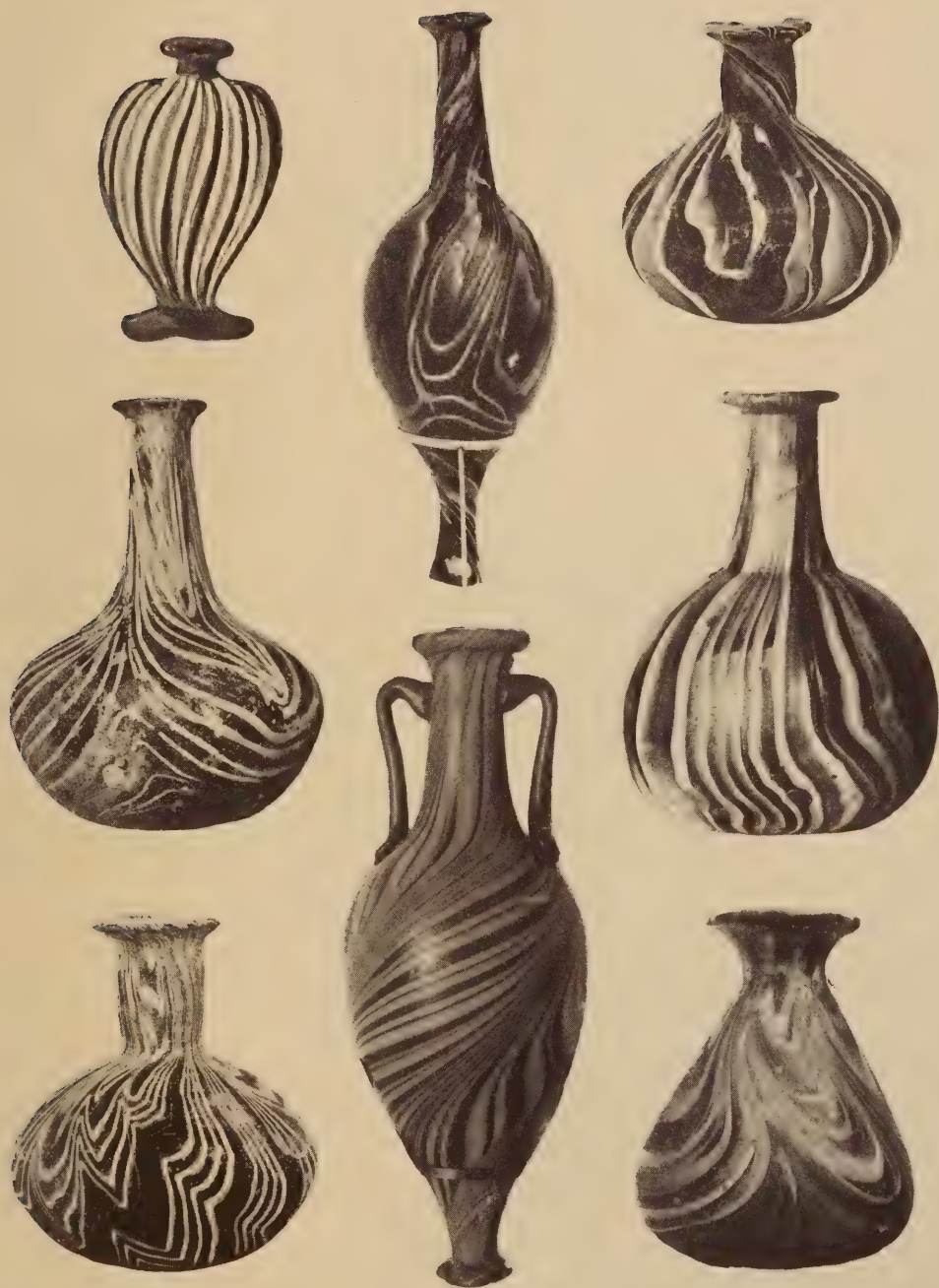


Plate 43. Stratified glass vases, 1st century B.C. Syrian. Etruscan Museum, Villa Julio, Rome, *a*; Mrs. W. H. Moore Collection, *b*, *e*, *g*; Fahim Kouchakji Collection, *d*; the others, Metropolitan Museum.—See pages 193, 214, 227, 228.



Plate 44. Bottle of blue and white stratified glass. Sidonian, 1st century B.C. Mrs. W. H. Moore Collection. Found in Syria.—*See page 229.*

several entire vessels might result. Many of the fragments are, however, lost, having been faced in tops of marble and cement tables, ground off and polished so as to be attractive to buyers. They were sold mostly in England. The writer found several mosaic-glass fragments on the ocean shore near Ostia, making it probable that they came from a Roman galley, shipwrecked near the port. If so, they were probably made in Egypt. The writer has classified about one thousand separate types or patterns of mosaic glass, but he has found but few new forms lately.

Many of the Roman emperors took interest in glass. It is said that Caligula sometimes amused himself and friends by going around in the night time, entering glass shops, paying for the glass on the shelves, and then smashing the pieces and throwing them around. Might it not be possible that the two large hoards of glass fragments mentioned above resulted from such revelries?—Pls. 26–34.

Although the finer types of mosaic glass vessels were discontinued after the time of Nero, or with the improvement in the manner of blowing glass, it was never lost as an art. It was continually used in the making of glass beads, with ever changing designs, so that it is now quite easy to determine the date of a mosaic bead, and after it date objects found in the same tomb. So far the writer has figured and recognized more than one thousand varieties with perhaps two hundred well defined types. Of mosaic glass, as it was used in vessels, he has segregated fourteen hundred varieties which can conveniently be grouped in fifteen main types ("Antique Glass," *The Art Bulletin*, Vol. II), referable to three great main classes: *Surface Mosaics*, *Imbedded Mosaics* and *Matrix Mosaics*, a subject too vast to be contained in a single chapter and which can not be more than lightly referred to in this book.

The design, technic and material which enter into the mosaic glass types are so consistent as make it possible to classify them according to their dates. This is further facilitated by the type of color given to the glass, some colors appearing suddenly at a certain time. Or a certain color combination appears at a certain time. For instance, bright lemon-yellow opaque glass appeared in the 3d century together with grass green. In the 6th century a deep orange appeared together with pale opaque celeste and cerulean blue. Once the earliest occurrence of a certain mosaic glass color has been fixed, the classification of the mosaic glass types becomes easy and convincing. This sudden appearance of certain colors in glass points to discovery, importation and new trade routes, rather than to fashion and taste, a subject, or subjects, for study which, so far, no one has seriously undertaken.

KEY TO THE CLASSIFICATION OF ANTIQUE MOSAIC GLASS

SURFACE MOSAICS

OVERLAID THREADS. More or less connected with, and at times identical with, the dragged patterns described elsewhere. The glass threads are placed on the softened surface of the matrix and then rolled into the matrix, smoothed down and even

polished by grinding. This technic is not confined to any special period. It was first in use in the XVIIIth Egyptian dynasty, about 1500 B.C.

LAMELLATED THREADS AND BANDS. Thicker threads were flattened by rolling while semifused, and either incorporated with a matrix in the way of the thread technic just described or several bands were joined sideways. In the former instance the viewer beholds a distinctly colored matrix under the colored bands. This was often combined with columnar rods, sections of them being placed on the surface matrix and rolled in.—Pl. 34.

INCRUSTED MOSAICS. Fragments of glass were scattered over the surface of the matrix and rolled in, smoothed down and even ground down. The earliest use of this technic dates from the 8th century B.C.—Pl. 36.

STRATIFIED EYES. This was a technic first practiced in the XVIIIth and XIXth dynasties, and consisted of placing successive drops of glass on the matrix, the top one being smallest, the effect being that of an eye, or eyespot with rings. This technic was practically discontinued in the time of the later Ptolemies, and superseded by the columnar rod.

GUTTA OR DROP MOSAICS. A type of the incrustated mosaic, the only difference being that in the gutta the incrustations are fused so as to appear like rounded drops. This type appeared in the time of Augustus but became common in the 1st century A.D. However, many fragments of this type are not antique but Venetian.

UNITS IMBEDDED IN MOSAIC GLASS

The ornamental units are imbedded in the matrix, either by mixing fragments of colored glass in the fused matrix of plain glass, or by fusing fragments so as to form a mass. Or bands were allowed to fuse in the matrix. It must, however, be noticed that in almost every instance that the writer has examined glass thus labeled in our museums, he has found the technic was quite different and that the bands were sections of stratified glass imbedded in the surface. The most interesting specimen being the white and brownish cinerary urn from Milan, now in the Metropolitan Museum, one of the most precious specimens of antique glass known. According to one or the other of these technics we can distinguish the following types of imbedded mosaic glass:

TRINA OR LACE GLASS. Really a horizontal use of columnar rods. In this type we see threads and bands inside the matrix. Invented in the time of Augustus, it was perfected by the Venetians. It was common in English glass of the 19th century, but made without artistic taste, though with a perfect technic.

WAVED RODS. Rods were bent by fusing into the matrix so that shadows are cast by the thicker parts. Probably exclusively Venetian, though specimens described as "antique" are seen in collections.

GOLD-LEAF GLASS. In this type fragments of gold and silver leaf were mixed and fused with the matrix. All specimens seen by the writer were Venetian though dated "antique." But few specimens are known.

IMBEDDED CRYSTALS. But few specimens known. The date is uncertain. All seen by the author were Venetian.

MATRIX MOSAICS

MATRIX MOSAICS. In this class the mosaic decorations penetrate the whole matrix, appearing both on top and below. According to the technic we can readily distinguish between the following types:

AGGLOMERATED MOSAIC GLASS. The whole matrix is made up of fragments which reach both surfaces of the glass, and which form a real "breccia," a variety of conglomerate often found in nature. This type of glass was common in the XVIIIth Egyptian dynasty, specimens of great beauty having been found in the Palace of Amenhotep at Thebes and at Lisht.

MACULATED AND MARBLED MOSAIC GLASS. The whole matrix is made up of fused and stirred fragments of colored glass in a plain matrix. The result is an imitation of marbles and other minerals.

ONYX GLASS. This is a type of the former made of various transparent and translucent particles of glass mostly in more or less concentric layers in order to imitate onyx, chalcedony and other silicated minerals highly prized in antiquity. Ancient writers claim that murrhina was imitated; if so, we must seek it in the "banded glass," for instance in the beautiful cinerary urn in the Metropolitan Museum.

STRATIFIED GLASS OR LAYER MOSAICS. This glass, which has already been described, is in reality an early type of mosaic glass made by a special technic. It consisted of fusing alternate sheets of glass of different colors, and by using slices of the ends, cut at right angles to the general surface, either as decorations or as matrices for entire vessels. In the Augustan era whole vessels were made of this glass, but a little later it was only used in combinations.—Pl. 34.

COLUMNAR RODS AS STRATIFIED RODS. The rods were used, without imbedding in any special matrix, by simply fusing the edges and afterwards forming them into a tube. This type has been already described as stratified rods.—Pl. 43, *a*.

COLUMNAR MOSAIC GLASS. This is the general type of which the majority of mosaic glass was made during the early Roman empire. It is composed of three distinct units: colored or plain rods of precious glass matrix, colored or plain plates of precious glass matrix, and the filling. These types formed the mosaic pattern, which was produced by placing rods and plates upright in a mould with soft clay bottom to hold it in place. When the pattern was made up, the vacant spaces were filled in, generally with rods, of a different color or uncolored, or with pulverized glass. The latter, however, was rarely used, on account of its tendency to form bubbles. The majority of the mosaic glass contains only rods, the plates being used especially in representing lines and faces. The columnar rod came into use in the time of Augustus and has continued in use ever since.—Pls. 28, 31-36; Text Fig. 112.

GOLD-GLASS. Gold-glass sometimes enters as a unit in stratified and mosaic glass and on that account is mentioned in connection with the latter. It is well to recollect in this connection that we can distinguish several kinds of gold-glass according to the technic. A common characteristic is that the gold was applied to a glass surface and protected with a sheet of transparent glass, the ends being fused to prevent separation of the sheets. Instead of gold and silver, paint was used in the cheaper types. The principal divisions of this glass are:

STRATIFIED GOLD-GLASS. When sheets of glass alternated with sheets of glass coated with gold leaf.—Pls. 43, 45.

GOLD-GLASS RELIEFS. When the pattern was first made in relief by means of a mould, and then coated with gold leaf and afterwards protected by a plain transparent sheet of glass.

GILT TUBES. In this type a tube of glass was coated with gold leaf and protected by inserting it in a slightly larger tube. This was the technic used in beads.

PAINTED GLASS. With or without protection of a transparent sheet of glass.

ADDITIONAL NOTES ON MOSAIC GLASS UNITS

Mosaic glass is an agglomeration of different units, arranged in a pattern, or casually mixed, and later fused so as to form a matrix. The fusion is often defective, hence the mosaic glasses when breaking often follow the boundaries of the units. Mosaic glass was always made in the nature of a pad, or as pad-glass, and as such was used in open, flattish vases; or was first rolled into a tube which was then blown to form a flask in the same manner as stratified glass. The units of mosaic glass in antiquity consisted then as now of rods, bands, plates and sections of rods.

ROUND RODS. Round rods of glass were plain, colored or uncolored, or they were composites, each consisting of many parallel rods; or the rods contained spiral threads in their interior and hence were called trina rods. The rods when used in upright formation are called columnar rods. Or they were used horizontally, alternating with flat rod-bands, sections of rods or flat rectangular sections. The larger units are distinguished as rods, the thinner as threads. The latter were both used as decorations on the surface of the vessels and confined to the interior of the matrix. The composite columnar rods when made of opaque glass were ground down in order to show the inner details and bring them to the surface; or they were sectioned so as to show the inner structure on their ends which then formed the pattern. The marvelous minuteness of the pattern, often exhibited in our museums under a magnifying lens, was simply made by drawing out and elongating the rod, the details diminishing as the length increased.—Pl. 29.

DIMINISHING THE COMPOUND ROD. The original length of the compound rod was generally about six inches; its width about half that. It was composed of perhaps hundreds of minor rods of different colors which had been arranged in a pattern, the latter formed by the flat ends of the rods. When fused, the chunk of glass was rolled out or it was drawn out by means of two iron plates with handles,

one attached to each end of the rod by fusing. The glass and the iron readily adhered together and the chunk could thus be lengthened and diminished in thickness by pulling. The relative position of the rods which formed the pattern was not materially disturbed if care was taken not to twist the rod, and when finally cut in sections the pattern was found to be microscopic instead of gross. A pattern originally from three to six inches wide could readily be diminished to a width of three millimeters.

RODS AND BANDS. Bands were made from rods in different ways—by passing them between rollers, by simply pressing, and by drawing them through a flat opening. Through the first and the second process the bands became streaky as if furrowed longitudinally. By neither process were they made perfectly flat and even, the center always remaining thicker, a characteristic of all the rods and bands of ancient mosaic glass which made the centers darker than the edges, as seen when they are viewed in transmitted light. Bands were also made by grinding down rods on two opposite sides, as, for instance, was the practice with trina rods, in order to bring the inner spiral threads to the surface. Vessels were made entirely of rods in various ways. The rods could be fused by their sides, and the resulting pad rolled up to form a tube. Or the rods were spread out funnel-shaped as by the Venetian glass makers. In mosaic glass, rods, bands, trina rods, plates, sections, and every other conceivable unit were alternated on a sheet of translucent glass fused to adherence and used as ordinary pad-glass for the manufacture of vessels of any type. When the units overlapped, the places which covered each other appeared darker, red over green and yellow appearing brown, as in the famous Vatican cup of lamellated technic.

UPRIGHT PLATES. Much of the mosaic glass was made with upright plates alternating with rods. The technic consisted in placing the plates on a soft base of clay so as to form a pattern and filling in with upright rods of different colors. In this manner any figure, even a portrait, could be made. The next step was to fuse the whole and follow this up by drawing out the roll into rods or even threads. Cross-sections of the rods and the threads would then show the face, bird, or geometrical pattern in diminished or even microscopic size.—Fig. 112, II, IV.

A scroll could also be made from upright plates in two different ways. The plate could be rolled up on itself, like a paper scroll and cross-sections would then appear with a scroll in the center. Or short upright plates were arranged on a mould base in the form of a scroll, and the space between filled in with plain rods of any color. Cross-sections would then show a scroll. The two technics can be readily distinguished from each other by viewing them with a magnifying glass. Those made of many plates possess little projections here and there, resulting from the edges of the plate having been imperfectly joined.—Fig. 112; Pl. 32.

BUST PORTRAIT OF AN ORIENTAL POTENTATE

Height, 1.75". Mrs. W. H. Moore Collection. 1st century B.C. Apparently Syrian. Made in the technic generally called Ptolemæan, with minute details arranged with great precision and without disturbance during the process of diminishing the



Fig. 112. Units of Mosaic rod-glass.—Lotus seeds, seed heads with seed escapes, I—ends of upright, curved plates, II—upright plates, curved, triangular, tree of life, square columns, III—plates and rods forming wheels, checkerboard, portraits, star beads, IV—wheels, stars, comets, flowers, V—petals, flowers, made of rods, VI—Augustan era, *a*, *b*—tree of life, 6th to 7th century A.D., *c*—Venetian, *e*—Augustan, *f*, VII—comparison between moulded and mosaic types—moulded, Sidonian, *a*, *d*—mosaic, Ptolemaic, lotus plants, *e*, *g*, VIII.

block. The tile is flat and ground plane and flat. It represents an Oriental, like a Kurd, with tall Kurdish or Persian cap under which descend long hair-locks around an oval face. The cap is yellow with green disk-like decorations; the hair fringe is red, but the three long hair locks which hang down the sides are made with alternating bars of opaque white, vermilion and black. The outlines of the face are gray black, with the whole set in a pale gray-blue matrix as a background to the picture. A very fine representation of the type figured by Kisa (Figs. 169-172), but of great dignity and seriousness in design. This art was probably originated and practised in Syria, not in Sidon and Rome. The motifs in this class are clearly Egyptian, often representing lotus buds and flowers, scarabs, ankh-crosses, flowers and trees of life. The portrait in the Munich Antiquarium (Kisa, 177, *e*) is of this same type as the Moore portrait. Portraits of a related type are also found on small spherical glass beads, about half an inch in diameter, often found in Egypt, each decorated with a row of two or more portraits of a lady, queen or deity.—Pls. 27, 28.

MOSAIC PAD-GLASS CYLINDRICAL CUP

Height, 3.53"; diameter, lip rim, 4.47"; base, 3". Mrs. W. H. Moore Collection, 758. 1st century B.C. Syria.—Pl. 29.

A cylindrical cup with flaring rim and rounded base. Matrix, deep violet brown, with opaque white rods, the latter arranged in sets, each containing three spirally connected rows of about twenty-five rods graded from the outer row inwards. Through stretching the pad, most of the rods are diagonally placed in the matrix, resembling comet tails, but the undisturbed arrangement is seen on the base. There are two concentric ground bands around the body. The whole was finished and reduced to size and form by grinding down from a thicker vessel.

PLATE OF COLUMNAR MOSAIC GLASS

Height, 0.7"; diameter of top, 10". Mrs. W. H. Moore Collection. 1st century B.C.—Pl. 30.

A flat plate with beveled sides made of columnar mosaic glass ground to thinness and form. The units comprise a central rod surrounded by a ring of seven circular units, and two other distinct units. One consists of a yellow scroll in emerald green matrix of rectangular form. The other contains a central rod of opaque white-lined vermilion red. Surrounding it at some distance are eight yellow circular rods in dark violet matrix. Around them a circular general border of vermilion red, and outside of it a deep violet matrix of rectangular form. The whole is composed of about four hundred units.

LOTUS BOWL OF BLUE MOSAIC GLASS

Height, 2.07"; diameter at rim, 4.9"; base, 2.07". Mrs. W. H. Moore Collection, 752. 1st century B.C.—Pl. 32, and Pl. IV.

Semispherical cup of superb blue matrix of translucent glass with units of columnar rods, elements containing a central scroll of yellow around a central staff in a closed ring. Another series of units contains five minor yellow spirals separated by walls or bars, all somewhat confluent. Some are surrounded by upright white rods graded from small to large. The eighteen ribs end on a horizontal line about 0.5" below the rim. Their triangular upper ends form the shoulder of the cup as in most specimens of this type.

CANTHARUS CUPS OF MOSAIC GLASS. The semispherical cup is with or without a foot stand. The rim is strongly marked, flaring outwards. Some are made of columnar mosaics, others of lamellated sections. Some are decorated with fused strips of stratified glass.—Pl. 33.

CUPS OF LAMELLATED GLASS. 1st century B.C. Cantharus cups made of sections of lamellated units, of composite flattened rods and here and there with plain squares of thin sheets of glass, all superposed on a more or less transparent matrix, are among the show pieces of ancient glass. The cantharus in the Vatican museum, Egyptian department, is especially beautiful. Many fragments of such glass were found in Rome, Pl. 35, the central figure from the Metropolitan Museum, is a related type.

LAMELLATED BOWL PLATES OF THE AUGUSTAN ERA

Until now no specimens have been found in Syria, but some in Italy and Gaul. Innumerable fragments have been found in or near Rome. This type includes the Hellange cup in Luxemburg (Kisa, Fig. 213, pp. 520, 524, 587); the Trier plate (Kisa, Fig. 2095, p. 527), several in the Metropolitan Museum and a few elsewhere. The elements are sometimes arranged to form a cross, sometimes they are parallel. The type is closely connected with similar cups made entirely of rods or rods and bands. The present-day Venetians imitate the type and some have been sold as antique though they are quite modern. The antique ones are more irregular and lack the glaring, disagreeable colors of the modern work. In these vessels trina rods, plain rods, plain bands made from rods, and sections of square and circular composite rods enter to make a brilliant decoration. The rim is invariably protected by a trina rod.—Pls. 34, 35.

PATELLA SACRIFICIAL CUPS, MOSAIC ROD GLASS. Two bowl cups in the Mrs. W. H. Moore Collection, 3" to 3.5" in diameter, made of composite mosaic glass rods, mostly secondary rods, yellow with red centers, or white scrolls mixed with floreate rods in blue and emerald green matrix. Augustan era. Syrian. Colored Pl. IV.



Plate 45. Stratified tubes, 1st century B.C. Syrian. Boston Museum, *a*; Metropolitan Museum, *b*, *c*. The central specimen is made of rod scrolls of stratified glass.—*See page 230.*



Plate 46. Three-sided blown and moulded bottle, 1st century A.D., with relief figures of Silenus and Bacchus. Mrs. W. H. Moore Collection.—*See page 232.*



Plate 47. Three-sided blown and moulded bottle, the same as on Plate 46. The figures are Pan, Silenus and Bacchus. 1st century A.D. Mrs. W. H. Moore Collection.—
See page 232.



Plate 48. The Dionysus beaker from Aleppo, Syria. Reduced size. 1st century A.D. The moulded figures are Pan, two nymphs, Bacchus. Fahim Kouchakji Collection.—
See page 232.

PART VII. SIDONIAN ROD-GLASS, RITUAL, MOULDED, LOTUS CUPS; AND STRATIFIED GLASS

ROD-GLASS VASES OF THE AUGUSTAN ERA

A PAD was made of parallel rods which were fused to adherence, after which the pad was pressed in a mould, or otherwise formed by hand. We can distinguish various kinds according to the quality of the rod, which could be monochrome, or with alternating and various colors, or made of trina glass. This type is related to the stratified rod-glass, but differs in that the pad was not rolled up into a tube, a circumstance which places the type close to the mosaic glass.—Pl. 35.

SIDONIAN ROD-GLASS CUP

Height, 1.7"; width, 3.6"; foot ring, 0.4" by 1.8". Mrs. W. H. Moore Collection, 727. 1st century B.C.—Pl. 35, *a*.

A small but deep cup without handles, lined with a rim of chrome-yellow threads in translucent glass. The colors of the rods are as follows, from top to base: one opaque milk-white, one pale blue-green, three milk-white, one pale dull greenish yellow, two translucent uncolored separated by thin Naples yellow, broad band of violet-brown, transparent narrow rods, a broader band of green-blue, a broad band of greenish lemon yellow, opaque white, two bands of violet-brown separated by Naples yellow overlapped by opaque white. Probably from Syria. The cup is thick and was ground to thinness both interiorly and exteriorly. In this technic is made the famous Trier bowl figured by Kisa, Fig. 205, p. 527. The Trier bowl has additional bands of lamellated sections of columnar rod plates and plain rectangular sections.

SYRIAN ROD-GLASS BOWL. Height, 3"; diameter, 5.8". Found in Syrian tomb enclosed in a larger pottery bowl, and thereby entirely protected from oxidation. Made of violet reddish brown rods exteriorly decorated with drops of ivory-white paste glass. One of the best preserved antique glasses known.—Pl. 35, *c*.

SIDONIAN MOULDED PAD-GLASS VASES

The pad was formed in a plain mould or in a mould with an intaglio to produce designs in relief. All these vases seem to have been made for ritual service. We can separate several groups: *Caput Vases*, with single or double heads back to back; *Ritual Libation Patella Cups*, without ribs, the size of a hand; *Patera Bowls*, with moulded ribs, and larger than the former.

SIDONIAN VASES WITH SINGLE OR DOUBLE HEADS

A vase with one or both sides decorated by means of moulding with one or two faces was known in Greece several centuries before glass-blowing was discovered. The type, however, which is represented in glass cannot be earlier than the 1st century B.C., because the finest specimens are made of ivory paste glass, continued with modifications and with a steady degeneration of the general type until the 4th century.

The faces and heads represented those of Bacchus, Venus, Medusa, Eros, fauns, and even man, especially those with caricatured features.

We can separate many types according to the form of the vessels, such as flattened or compressed cylinders, three-sided flasks, flasks with five or more sides, etc. Some of these are without neck, others have neck, mouth and lip rim. Others are in the form of a many-sided pyx or box-cup; others are columnar, some again are cut-off cylinders. The absence of a special base is the rule.

Some few are made by blowing a bubble in a mould, others by pressing a pad in a mould composed of two or three units. The mould was generally made without place for the neck, which was added afterwards by free-hand according to the taste of the artisan. While the body of the vase was moulded in parts, the neck was never moulded but bubble-blown. The line of demarcation is generally distinct and in the form of a little ridge.

GEOMETRIC SYSTEM

The outlines of the vase form a rectangle repeatedly divisible in three equal parts both as regards size, form and proportions. The only rectangle of this type possible is the one named root-3 rectangle in the Hambidge system. The correspondence between the logical diagram and the design is, however, often vague. The lower part below the face, including the neck and breast, is confined in a first-division rectangle. There is just enough correspondence to show that the artist had a dynamic geometric conception in mind.

SIDONIAN SACRIFICIAL CUPS; RITUAL CUPS

This general type consists of open semispherical or truncate-spherical cups of small size but too small to have been used for the household table. Another type is larger and flatter and might have been made for table use. We can separate them in two

classes according to whether they are plain or decorated. Or in three classes if we take the form and other characteristics into consideration.

PATELLA OR PLAIN SACRIFICIAL CUPS. Made of precious ivory paste glass or of other, opaque or transparent, glass of finest quality. They are plain without decorations.

LOTUS CUPS OF SEMISPHERICAL FORM. About as high as wide, made of the same precious glass as the former. The outside is nearly always decorated with ribs, banded before moulding.

LOTUS CUPS OF FLAT FORM. Made of common uncolored glass or of mosaic glass. They are of much larger size than the former, and might have been made for table use. Of this type many have been found in Pompeii or with coins of Nero. The earliest are flatter, the latter ones are higher, but never as high as those of the second series.

A common characteristic of all these types is that the mouth rim is more or less upright and narrower than the shoulder of the bowl. In this character they differ from all vessels made after their time.

THE PATELLA SACRIFICIAL CUPS. The size is minute so as to fit the hand of the sacrificer, in the manner we see represented on reliefs, statuary and mosaics. Their use was that of holding the libation in the rites of the public and the household gods. The best are made of opaque white or brilliant red ivory paste glass. Some are made of blue or green transparent glass while others are of mosaic glass. Those of ivory paste glass come mostly from Syria. In delicacy of form and technic they are unequaled by any other antique glass. They were produced by pressing a sheet of pad-glass in a mould, which when hardened was ground to form and size on the potter's wheel or with a hard tool. Those of mosaic glass were first backed up with coarse common glass in order to hold the columnar rods in shape. This poor quality of glass was later ground away leaving the fine quality of glass in view on both sides.

Cups of this type made of pottery have been found with coins of Claudius. Others seem to be earlier, and those of ivory paste glass based on the dynamic or Greek system of proportions are undoubtedly of the 1st century B.C. Compare Koenen XIV, 10, and Oswald and Pryce, Pl. XLIX. The identification was made possible by the finding of similar cups, identical as to both form and size, in the hands of emperors and celebrants of sacrificial rites represented in statuary and on stelæ of the early Roman empire. They are of a size to comfortably fill the celebrant's hand and seem to have been a specialty of that period, the Greeks having made use of much larger vessels for the same purpose.

The cups with the best proportions are made of ivory paste glass. The cups made of mosaic glass are nearly as delicate. Those of plain glass show a continued degeneration towards the 2d century, and after the beginning of this century the cups are made of blown glass generally furnished with an added collar, which detracts from the form, though more convenient for a firm grip of the hand.—Pl. 36.

SACRIFICIAL PATELLA CUP OF IVORY PASTE GLASS

Height, 1.65"; diameter, 3.45". Mrs. W. H. Moore Collection, 728.—Pl. 36, *a, b*.

Made of opaque white ivory paste glass. Both the outer and inner surfaces are glossy. The lip rim is slightly concaved. There is a narrow foot rim which was cast at the same time in one with the body proper. The diameter, twice that of the height, was based on two squares, but without proper interior correspondence between the actual form and the calculated and logical diagram. Syria.

SIDONIAN SACRIFICIAL PATELLA CUP OF CHERRY-RED GLASS

Height, 1.65" by 3.5". Mrs. W. H. Moore Collection. 1st century B.C.

Made of thick ivory paste glass of deep carmine cherry-red color in part covered with a thick gray patina. Similar in form to the ivory-white cup already described but with slightly different proportions of the two main parts. The cherry red in antique glass is the rarest color, only used in the Augustan era. It differs entirely from the cinnabar red which was in use at the same time and continued during several centuries, long after the art of producing the vermilion cherry red had been lost.—Pl. 36, *c, d*.

SACRIFICIAL PATELLA CUP OF MOSAIC GLASS

Height, 1.8"; diameter at top, 3.96"; base ring, 1.57". Mrs. W. H. Moore Collection, 751. 1st century A.D.

The matrix consists of columnar mosaic rods in either blue or green base matrix. Those in the green matrix contain two concentric rows of white or yellowish columnar threads in a yellow-brown matrix.—Pl. 36, *g*.

SACRIFICIAL CUP OF COLUMNAR MOSAIC RODS

Height, 1.52"; diameter at top, 3.65"; base ring, 1.55". Mrs. W. H. Moore Collection, 650. 1st century B.C.

The matrix is made of two decorative mosaic units, both set in transparent emerald green matrix which in direct light is olive green. The units have yellow centers and a vermilion core, and are surrounded by white upright satellites. The other units have white center and red envelope surrounded by chrome yellow rod satellites, in two concentric layers or rings in green matrix. Finished by grinding. Probably from Syria.—Pl. IV.

SACRIFICIAL PATELLA CUP OF MOSAIC GLASS

Height, 1.6"; width at top, 3.7". Mrs. W. H. Moore Collection. 1st century B.C.

In form this cup is similar to other patella cups of mosaic glass, but the walls are

ground thinner than in most specimens. The units are columnar rods and cells, some in pale blue transparent glass matrix, others in emerald green transparent matrix. The whole is covered with a fine patina and iridescence. Syria.—Pl.36, *b*.

RIBBED AND BANDED SPHERICAL CUPS

Sidonian of the Augustan era

The form is truncate-spherical with contracted diagonal neck in diameter narrower than the bulge. They are always banded and ribbed and the bands rise with the ribs, proving that the latter were made, after the banding, in a mould with cavities in which the ribs were produced by forcing the matrix into grooves. The fact that these small bowls are made of the most precious glass possessed by the Sidonians, such as deep azure blue, ivory paste and even emerald green, proves that they could not have been made in the 3d century A.D. as assumed by Kisa, p. 410, Fig. 218, etc., but belong to the period when such glass was made. The circumstance that some have been found in 3d century German tombs proves nothing relative to their origin, because they might have been, and probably were, derived from robberies of older tombs. Kisa mistook the technic, saying that the bands were made by enamels painted on the surface (p. 410); but on the same page he refers to the type as band glass, which is nearer correct. The bands were produced in the usual manner by winding round or flattened threads of glass around the body, which was then pressed in a mould. This process was most suitable to wide cups, but not as well to narrow bottles and flasks. The amphorisk of this type and technic was made from a moulded and ribbed tube, blown out in the manner of tube-blown glass in general. Most of the specimens come from Syria, and it seems probable that they were made in Sidon in the 1st century B.C.—Pl. 37.

Kisa, however, mentions and figures several specimens found in Germany: Fig. 217, p. 450, from Cologne; p. 410, Fig. 218, also from Cologne; and the two represented in colors on his Pl. IV. The illustrations show clearly that these are not painted glasses, but banded and dragged, and later moulded in order to produce the ribs. The same error attaches to the two beads on the same plate. They, too, are dragged and not painted, and No. 5 is not Italian "filigran" technic but stratified glass. The beads belong to the 6th century, the stratified one and the two cups to the Augustan era. Kisa dates these specimens to the 3d century, which certainly is wrong. The type of glass they are made of is the same as the Sidonian ware of the Augustan era, and we must conclude that these and similar specimens were imported and originally derived from older, 1st century B.C., tombs. On page 405 Kisa correctly describes the technic of the "fern pattern," but on page 412 he speaks of it as made by "brush strokes." That the bowl cups were actually dragged is readily ascertained by examining them with a magnifying glass. The ribs do not always coincide with the dragged rows or columns.

IVORY PASTE CUP WITH BLUE BANDS

Height, 2.07"; diameter, 4". Mrs. W. H. Moore Collection, 742.

Augustan era, Sidonian workmanship. Made of opaque white ivory paste pressed in a mould with grooves for ribs. Before pressing and before the ribs were formed, the body of the cup was wound spirally with opaque blue bands, which were raised with the ribs through being pressed in the mould.

In some specimens the bands were dragged before moulded, but in such a way that the perpendicular strokes coincided with the fins and ribs. Pl. 37, *a*. The lower left illustration is best suitable for studying this technic.

CANTHARUS CUP WITH CENTRAL INNER MINUTE BOWL

Height, 0.7"; diameter, 3.8". From Alexandria, Egypt. Mrs. W. H. Moore Collection.

A unique specimen, made of hard, ringing glass, violet-brown, interiorly lined with opaque white glass of somewhat bluish tint. The center of the interior of the cup is occupied by a minor spherical, truncate bowl. The exterior is decorated below the rim with spiral, opaque white threads. Judging from the matrix and the outer threads, this specimen is contemporary with the truncate spherical bowls illustrated in Pl. 38.

THE LOTUS CUPS; PATERA CUPS

This name is now proposed for a large series of semispherical and truncate-spherical, or even flat, cups which are decorated with either lotus petals or with ribs which vanish on the lower part of the body. Some possess both the lotus petals and the ribs and in addition large lotus buds or seeds between the uppermost parts of the ribs and petals. This type of cup can be traced to early Ptolemaic cups of silver, (Pl. 39, *a-d*), which are quite typical of the oldest types. On the same plate (*e*) is a glass cup of the Augustan era for comparison. On Pl. 37 are represented five cups of so-called "banded glass" and one amphorisk. All are characterized by the contracted neck opening and the more or less set-off shoulder. The later, 1st century A.D. cups, made of pad-glass or blown glass, moulded to form and decoration, are seen on Pl. 40, *a-e*. The 2d century cups of the same types are higher and coarser and less carefully formed, with ever widening opening, with a rim strongly sloping inward and downward.—Fig. 113, *d-f*; Pl. 41.

THE DECORATION ON THE LOTUS CUPS. The corolla-like ribs and ridges which rise from the base of the cups and end abruptly on the shoulder were probably derived from the lotus petals or corolla as seen on the Ptolemaic silver cups (Pl. 38), and before them on much older Egyptian objects, but especially on the lotus beads, as already mentioned. In some types the petals are contracted and merely outlined as ribs or fins. Their upper circumference was filled out with representations

of lotus buds and seeds, or the ribs themselves were greatly widened at the upper end and permitted to taper downwards as the area diminished towards the center of the base. All of these types are contemporary with melon beads and some are related to the Pompeian beakers with their ribs, flutings, arches and lotus buds. The realistic type of lotus corolla with well designed petals in two rows, was common on silverware in the Augustan and Tiberian eras and is found on both the Boscoreale,



Fig. 113. Sidonian libation cups, Augustan period.—Patella, *a*—banded lotus bowls, *b*, *c*—lotus cups, patera, *d*, *e*, *f*.

the Hildesheim and other vessels of that same period. It is also found on the Antioch chalice, on the base of the Seven-armed Candlestick, on the Arch of Titus in Rome, and on much of the silver found in Pompeii, as well as on innumerable painted vases on the walls of the Roman villas of the 1st century A.D.

DIFFERENT MATRIX TYPES. We can separate the following lotus patera types: uncolored greenish tinted glass, with close or bold ribs; dark blue glass matrix, with bold ribs and above it a Greek fret; violet-brown glass decorated with fused-in strips of opaque white glass, separated by layers of blue, brown or any other tint in use at that time; mosaic pad-glass bowls with columnar rod elements, or with scrolls. The same type of patera was common in pottery and must have been widespread. Koenen dates those with a wide base to the Flavian emperors, Pl. XII, 18–21, p. 86. It is, however, quite evident that of his examples Fig. 19 is the earliest and has nothing whatsoever in common with the semispherical specimen, Figs. 18, 20, 21.

The patera bowls are among the most beautiful varieties of ancient glass. The most beautiful of all so far seen by the writer is the one of deep blue matrix with well separated ribs and with a bold, horizontal Greek fret in raised relief between the lip and the tops of the ribs. Deposited in the Metropolitan Museum by Mr. J. P. Morgan.

LOTUS BOWL, PETALS IN RELIEF AND GROUND LINES. Moulded and based on root-3 of the dynamic symmetry (Fig. 94). A truncate pad-glass bowl with sigmoid outlines of the body, decorated with isolated groups of raised ribs in sets of four, and between them raised petals. Above two series of ground horizontal lines. Yellow translucent matrix. In this remarkable specimen every detail of the main decorations corresponds with the inner diagram. Syria. St. Louis Museum, St. Louis, Mo. Size: 5.9" by 3.45" wide, 1st century A.D. Somewhat similar bowls, made of pottery, are described by Oswald and Pryce, Pl. LXXVIII, Fig. 5, early 2d century.

MOULDED CANTHARUS CUPS. At the base a low foot-ring. Two loop handles connecting rim and middle of body. One in Naples Museum is moulded with leaves. —Pl. 62, *a*.

TUBE-BLOWN FLASKS—PLAIN GLASS

The name has been reserved for flasks made from a sheet or strip of pad-glass by various technics. The pad was rolled up and formed into a tube and the base closed by either adding a case disk or by pinching. Or the strip of pad-glass was folded upon itself, which caused the base to be sack-like, or the strip was twisted and drawn to a closed point. This same technic in its various styles was also used in stratified rod-glass or in stratified strip-glass.—Pl. 42.

PLAIN TUBE-BLOWN GLASS BOTTLE

Mrs. W. H. Moore Collection, 695. Height, 3.45".

Made of plain blue glass first rolled into a tube. Form pear-shaped with inwardly swung sides, widest at the base and slightly contracted below. A form similar to that of the oldest stratified glass bottles known.—Pl. 42.

ROD-TUBE GLASS

This is the oldest type of vessels made from strips of glass. The technic consisted of fusing glass rods along their sides and forming them into a tube, which was later closed and formed into a bottle. By using alternate rods of blue, yellow, white and gold glass, beautifully striped bottles were made. When fused and formed the surface was ground down to proper thinness. Sometimes the rods were flattened before fusing, such glass approaching the stratified glass in delicacy. But few specimens of this technic are known. Their technic was never until recently understood. Kisa and other authors simply referred to them as striped glass.

The first step in this process was always the same, and consisted in fusing the sides of several differently colored, parallel rods. The forming of the tube was the next step in the process. This was done in different ways. Either the pad produced by fusing the rods was folded upon itself into a tube, or it was twisted spiral-like into a tube. The decorations resulting from the coloring of the rods could be waved by turning the rods back and forth as they were made into a tube, or even after the tube had been made. A good example of this type of glass is that illustrated by Kisa, *Das Glas*, Vol. II, Pl. II. He, however, confused this type of glass with the late Egyptian core-wound glass among which this specimen is figured. Another specimen (Eisen, *Art and Archaeology*) is preserved in the Museo Etrusco, Rome, in the Villa Julio.—Pl. 43, *a*.

Tubes made of rods twisted back and forth are in the Museum of Fine Arts, Boston, and in the Metropolitan Museum. Originally the neck and mouth flanges in all these vessels were of bronze, simply inserted in the glass tube (Pl. 45, *a*, from the Boston Museum, the other, *c*, from the Metropolitan). These are magnificent and wonderfully effective works of art, never yet equaled.

The flask with bell-shaped body of the exact form as Fig. *c*, Pl. 42, but made up of



Plate 49. The Dionysus beaker, from Aleppo, Syria. 1st century A.D. Actual size. Fahim Kouchakji Collection.—*See page 232.*



Plate. 50. Sidonian moulded glass bottles. The temple series, 1st century B.C. to 1st century A.D. From the Metropolitan Museum; the central one from the Mrs. W. H. Moore Collection. Syrian.—*See pages 234, 247.*



Plate 51. Sidonian moulded flasks, Processional series. Syrian, 1st century B.C. to 1st century A.D.—*See page 250.*



Plate 52. Sidonian blown and moulded ritual flasks, 1st century B.C. to 1st century A.D. Vase, jewel shrine and plate, *b*; pine cone, pomegranate, grapes, *a*, *c*; trees of life, *d*; wreaths, *e*, *f*; Ornithopolis flask, *g*.—See pages 252, 253.



Plate 53. The Argonaut vase. Sidonian, 1st century B.C. to 1st century A.D.—See pages 254, 534; *Text Fig.* 230, III.





Plate 54. Sidonian blown and moulded flasks. Scrolls and geometrical patterns, *a, d, f*. Compressed Pilgrims' or hand flasks, *b, c, e*.—1st century B.C. to 1st century A.D.—*See pages 254, 271.*

parallel and bent rods of blue, green, opaque white, violet and gold glass in the museum of Perugia, Italy, has already been described by the author in *Art and Archaeology*. Two similar flasks are in the Metropolitan Museum, one in the Gréau the other in the Moore Collection.

STRATIFIED GLASS

The stratified glass proper is distinguished from the rod-glass which it resembles by having been made of strips cut from a stratified pad made up of sheets of glass of alternating colors.

The forms comprise flat dishes, tubes, flasks, pitchers and flasks with projecting fins. Probably other forms will in time be discovered. The technic naturally changed with the effect desired. The flat cups were produced by pressing a pad of stratified glass in a mould. The tubes were formed by twisting a strip of stratified glass so that it formed a tube, or a wide strip was folded upon itself. Vessels which possess beautifully looped decorations in the matrix were made by first folding the strips into loops, then fusing the loops into a sheet. The next step was to form a tube of the sheet and close the end by a single spirally wound strip.

The artistic quality of the stratified glass surpasses any other type of glass known. Those who have not seen the finest specimens of this type can have no conception of the beauty that can be embodied in glass.—Pls. 42-45.

STRATIFIED AMPHORISK

Height, 3.35"; diameter, 1.5". Mrs. W. H. Moore Collection, 666.

Matrix deep cobalt blue, irregularly looped with opaque white, heightened by overlaid white threads. The form is that of an amphorisk without handles. It was never ground to shape or thinness.—Pl. 43, *a*.

AMPHORISK OF STRATIFIED GLASS

Height, 3.5". Mrs. W. H. Moore Collection. Made of three strips of stratified glass, one of the strips being folded on itself into a loop. The layers alternate opaque white and very deep blue. The two handles are also made of the same glass. The body was ground to form. A specimen characterized by an absolutely perfect technic. Sidonian, 1st century B.C.—Pl. 43.

STRATIFIED GLASS AND APPLIED THREADS. In some flasks made of stratified glass the outlines of the stratifications are often heightened by the application of white threads carefully rolled into the surface. This is more or less in accordance with the practice to make the base of the vase from a special strip of glass which sometimes was not stratified, but had to be decorated with applied threads, dragged to conform with the general pattern. At the same time the sur-

face margins of the stratified layers were dragged so as to conform with the waves produced by bending the stratified rods. The thread, however, could not produce the vanishing effects of the layers.

STRATIFIED GLASS FLASK

Height, 3.4"; neck, 1.4"; width, 2.2"; lip rim, 0.9". Mrs. W. H. Moore Collection, 568.

Opaque white and yellow stratified glass, from two separate strips, each bent into a loop, the two afterwards formed into a tube globularly enlarged with a blowpipe. After the body was enlarged the upper part was drawn out into a tubular neck. The final step was to grind the body down to thinness.—Pl. 42, *e*.

STRATIFIED MOULDED BOTTLE WITH FINS

Height, 1.89"; width, 1.6". Mrs. W. H. Moore Collection, 545.

Made of stratified layers of violet-brown and opaque white glass. A single strip was first spirally wound and formed. When blown into form it was pressed into a mould which contained deep creases or recesses into which the matrix was forced, resulting in a row of fins around the girdle.—Pl. 42, *g*.

STRATIFIED MOULDED BOTTLE WITH FINS

Height 2.5"; width, 1.8". Mrs. W. H. Moore Collection, 546.

Made of a stratified strip of violet-brown and opaque white glass rolled into a tube which was later enlarged by blowing in a mould with creases for the wings.—Pl. 42, *b*.

STRATIFIED BOTTLE

Height, 2.5"; neck, 1.5"; width, 1.4"; lip rim, 0.6". Mrs. W. H. Moore Collection, 744.

Made of a strip of stratified glass containing five sheets of blue, brownish yellow, canary yellow, celeste blue and opaque white glass. The strip was first folded on itself and looped, formed into a tube and its lower end enlarged by blowing.—Pl. 43, *f*.

STRATIFIED GLASS BOTTLE

Height, 2.9"; neck, 1.7" by 0.5"; lip rim, 0.67". Fahim Kouchakji Collection.

Matrix alternating layers of stratified blue and opaque white glass. Two loops and base spiral. The lower part of the strip was twisted into cup shape, the upper part twisted into a tube and drawn out to form a neck. The body was ground to thinness.—Pl. 43, *d*.

STRATIFIED TURBINATE BOTTLE

Height, 4.2"; neck, 2.1"; width, 3.7"; lip rim, 1". Mrs. W.H. Moore Collection.

Of stratified glass, alternating sheets of superb blue and opaque white. The strips were first formed into five loops, each separate from the other, but fused by the edges to adherence. The next step was to roll up the pad into a funnel-shaped tube, and closing the lower end by a single strip of similarly stratified glass rolled into a spiral. The final step in the technic was to widen the body proper by means of a blowpipe. This is the most beautiful stratified vessel so far found. The vanishing layers of white and blue are most admirable, and the tint of the blue is unequaled.—Pl. 44.

SIDONIAN STRATIFIED GLASS PITCHER

1st Century B.C.

Height, 8.5"; width at shoulder, 4.5"; at base, 2.1". Mrs. W. H. Moore Collection.—Colored Pl. III.

This unique flask is made of stratified glass, by the method used in producing all other flasks of this technic. The glass was first stratified, then a tube was made of the size of the base of the flask, then the tube was enlarged by blowing with a metal pipe. Even the handle is made from a tube of such stratified glass, consisting of a stratified pad of glass rolled up around a core of common glass. The characteristic part of the flask is the foot, which is narrow, cylindrical and smoothed off. Only one vessel of this size and form is previously known, but that is a tube-blown pitcher made of plain glass decorated with common and ordinary dragged overlaid garlands. This vessel is said to have been found in the Danube. It would then be a part of shipwrecked tomb loot, lost there by returning legionaries who must have secured it in a 1st century B.C. tomb in Italy, or more probably in Syria, the place from which have come the great majority of stratified glass specimens.

The color is blue and white in alternating sheets, the white ones serving to heighten the blue. The blue tint is absolutely unsurpassed in charm, without being of that hard brilliancy of the later Roman glass.

PITCHER WITH DRAGGED PATTERN. Closely related to the blue stratified pitcher, Pl. III, is the one figured by Kisa, Vol. II, Pl. XI. This one is, however, made of plain glass decorated with dragged "bird-feather pattern." Under the slender handle is a small moulded face mask. Found in Germany, and now in the Bonn Museum.

SIDONIAN STRATIFIED GLASS CUP

Height, 0.81"; diameter, top, 2.8"; base, 1.35". Mrs. W. H. Moore Collection, 766.

Made of three doubled sections and two single sections of stratified pale blue and opaque white glass, made into a pad and pressed in a mould. The upper part, including the lip rim, is much wider than the lower base part. A very delicate and beautiful form.

POINTED TUBES. Stratified glass and rods. Narrow tubes with pointed ends made of stratified strips or rods. Several are in the Metropolitan Museum and one in the Boston Museum.—Pl. 45, *b*.

VASES WITH DRAGGED PATTERN. Vases with dragged pattern from the Augustan era are few in number, but of striking appearance. The best known is the pitcher figured by Kisa (Pl. XI) under the name of the "Ænochoë with bird-feather decoration from Hausweiler." It is a pitcher of the same general form as the stratified pitcher, our colored Plate III. It is undoubtedly correctly described by Kisa (pp. 410, 480) as an importation of the 1st century. The small amphora described below is probably of the same date and interesting on account of the quality of the white glass applied as threads.

AMPHORISK WITH APPLIED WAVED THREADS

About 1st Century B. C.

Height, 4.5". Mrs. W. H. Moore Collection. Probably core-wound deep blue matrix with two upper handles and pointed knob base. The applied threads are of opaque white glass of the same quality as in the best cameo vases, but the waving is not dragged but hand-waved. Probably Italian make. The technic suggests that perhaps all cameo vases were made in the same manner, and afterwards carved. The blue matrix was undoubtedly ground to form before the threads were applied.—Pl. 5, *d*.

PART VIII. SIDONIAN GLASS WITH MOULDED MYTHOLOGICAL AND SYMBOLIC FIGURES

SIDONIAN BUBBLE-BLOWN AND MOULDED VESSELS

VESSELS with the form of bottles, flasks, cups, etc., produced by blowing a glass bubble in a mould with two or three parts. The body is round, three-sided or six-sided. When the sides are separate and distinct we find a decoration confined to each side, sometimes separated by upright columns, and placed under an arch or tympanum. So far as we know, all the types are decorated with figures in relief produced by sunk areas in the mould. The majority of the specimens are based upon a geometrical system, some upon the static system, others upon the dynamic, always with some coincidence of inner diagram and decorative detail.

But few of the specimens are large; most are, in fact, quite diminutive, only a couple of inches high, or even less. The matrix is always of the finest types known, with colors sometimes imitating precious stones, such as emerald green, sapphire and ivory, etc. The character of the decorations, which represent sacred vases, circus emblems, palestra objects, victory prizes, etc., makes these vessels among the most interesting known. The following are the main types: beakers, cylinder cups, bottles and flasks. Special types: three-sided bottles with mythological figures, Pls. 46, 47. Beakers with mythological figures, Pl. 49. The temple series, six-sided flasks, each decorated with temple vase, Pl. 50. Flasks with processional objects, such as torches, thyrsi, etc., Pl. 51. Victory flasks, with wreaths and victory emblems, Pl. 52. Flasks with floreate, geometrical, basket and scroll designs, Pls. 54, 55. Ornithopolis flasks with birds; flasks with mythological designs, argonauts, golden fleece, etc., Pl. 53. Flasks with Jewish etrogs; Ennion and other signed flasks and cups, Pls. 56, 57. Cylindrical cups with Jewish emblems and objects, Pl. 58. Cylindrical cups with victory symbols, names, salutations, etc., Pls. 59, 60.

TYPES WITH JEWISH SYMBOLS AND OBJECTS. The only Sidonian vessels which until now have been described and figured by Jewish archeologists as containing Jewish symbols are the ones with figures of grape clusters, pomegranates and pine cones. This identification is, however, undoubtedly incorrect, for these symbols pertain to the rites of Bacchus and Isis and in this instance are most likely purely

Bacchic. We have, however, another type until now left unnoticed on account of the apparently abnormal representations, and this no one has been able to attribute to its proper source. The moulded figures are irregularly spheroid with protuberances, spots, warts and minute rugosities. The only natural object possessing such form is the Syrian and Italian lemon, which in ancient times was sacred in the Jewish rites and ceremonials, and, I believe, is yet in use in certain places. It is found represented on the Jewish gold-glass of the 4th century A.D. and was identified by De Rossi and Garrucci as "etrogs," the Jewish name for this fruit.

This is, however, the first time it has been identified on 1st century glass. Its identification is undoubted in the opinion of the author, and its presence on this glass gives strength to the author's theory that all the objects found represented on these minute vessels belong to a sacred ritual series containing temple objects, objects used in the sacred rites and in the sacred or ritual processions.

Other Jewish symbols according to the author's view are those on the ivory paste pyxis, containing sacred trees, the scroll of the Law and the buddings of the staffs of Aaron and Moses.—Pl. 58.

The purely Jewish types of the Sidonian glass with symbols would be the following, as far as ascertained: flasks with vegetable life symbols, both Jewish and pagan; vessels with the Law scroll, Aaron's staff buds, etc.; vessels with etrogs.

Each of these types will be described later, the specimens being classified according to form, some being bottle-shaped, others cylindrical.

SIDONIAN THREE-SIDED, BUBBLE-BLOWN IN A MOULD, BOTTLE

Height, 8.2"; neck, 3.3"; body, 4.75"; diameter neck opening, 9"; across the figures, 4.5"; base, 2.4". 1st century A.D. Mrs. W. H. Moore Collection. Syria.—Pls. 46, 47.

Uncolored yellowish tinted glass, translucent or transparent, bubble-blown in a mould of three parts. A three-sided cylinder with full-length moulded figures. Identification of the figures tentative. First side, man walking with a burden, perhaps Silenus carrying a wine skin. Second side, Bacchus with staff in the left hand, in the right a cup from which he waters a dog seated below. Third side Pan, in dancing pose. The heads of the three personages are indistinct as if they were veiled, possibly an accidental effect from the removing of the mould. One of the finest antique moulded glasses known.

THE DIONYSUS BEAKER

Sidonian, 1st Century A.D.

Height, 6.5". Found in the necropolis of Beroia, Aleppo, Syria. Owners: Kouchakji Frères, 1911; Friedrich von Gans, 1912, who valued it as one of the great glasses of antiquity and the gem of his collection; K. W. Bachstitz, The Hague; Fahim Kouchakji, 1926. Made of translucent amber-colored glass in a mould of two

parts, decorated with four moulded, upright, full-length figures in Hellenistic style. Closely related to the three-sided Dionysus flasks in the Giorgio Sangiorgi and Mrs. William H. Moore Collections. The figures in relief represent: a female bacchante with conspicuous flowing dress skirt, a narrow waist, the right hand holding the spirally curled end of a shawl almost exactly as the corresponding garments of the three seated goddesses on the ara pacis of Augustus. The next figure represents Dionysus or Bacchus in front view; the raised left hand holds the thyrsus staff; with the lowered right hand he pours wine from a cup to a leaping panther; over his left shoulder hangs the lion hide. The next figure is the god Pan dancing; goat legs; the two raised arms grasp and play the lyre; below him is a syrinx; the shoulder covered with a backward-flowing cape with radiating folds; face long with beard, pointed like that of a goat; head with horns and rays like the points of a crown.

The fourth figure is a nude, a mænad dancing. In front of her a perpendicular grapevine with leaves and clusters in the zigzags. R. Zahn dates this beaker to the 2nd century A.D., being unaware of the existence of beakers of the same exact form found in Pompeii—now in the Naples Museum, and in Sardinia—now in the Museum of Cagliari. And, as the two three-sided flasks with the same figures mentioned above are with certainty Sidonian of the time of Augustus, with figure like those on the ara pacis, we may with certainty refer all these specimens to the Augustan period.—Pls. 48, 49.

THE TEMPLE SERIES—FLASKS

The name is derived from the sacred vases depicted in moulding on each of the six sides of the flasks. While the body is pear-shaped and rounded, the fields in which the vases are seen are more or less flat. Each space contains one vase, flanked by columns which latter support an arch with tympanum gable, always decorated with a large conical object. The bases of the flasks are decorated with garlands, pine cones and grapes.

The flasks were blown in a mould consisting of three parts, all ending on a line with the apex of the arch which is strongly pointed. When moulded the neck was added by the artisan according to his individual taste, who thereby disturbed the dynamic symmetry in which the mould was formed.

The circumstance that the forms of the illustrated vases are but six, rarely repeated, and always succeeding each other in the same order, suggests that they represented sacred vessels in use in the temple, each standing under a tympanum in a niche or between columns precisely as depicted. What temple was actually represented I do not know; but it is not unlikely that it was the temple of the Sidonian Venus, Ashtoreth. This theory is suggested because the cone standing in each tympanum might represent the cone under which the deity was worshiped. It is known that several mythological deities were worshiped as a stone or cone fallen from heaven, and this might have been one of them.

The flasks are all minute, averaging two inches in height. This is one of the most

remarkable series of antique glass, all datable to the 1st century B.C. The most precious matrix was used, ivory pastes in different colors, red and emerald green in translucent glass.—Pl. 50.

In the diagram three specimens are illustrated in order to show the sequence of the sacred vessels and their respective forms. The latter varies but slightly in the different specimens. The vases in the diagram follow in exactly the order shown. In all, the writer has examined about 120 specimens, nearly all of which have been found thus far, and the sequence is always the same, with but few variations as to form. It will be seen that one of the forms is a crater or urn. Two seem to be jars, and two oil or wine pitchers.—Fig. 114.

FIRST TYPE. First to left taken at random. A cantharus or crater to hold fruit, with low stem and narrow foot, as in use in the 1st century B.C. Two large conspicuous handles. Base sometimes decorated with a lotus corolla. The cavity was undoubtedly used to hold fruits or sacred loaves. Possibly the fruit rested on a platter placed over the mouth.—Fig. 114, *a*.



Fig. 114. Sidonian, Temple series, represented sacred vases.

SECOND TYPE. The form is that of an amphora with foot-stand, or a jar. The base varies in the three specimens, but generally it is like that in the upper row. The form is more or less repeated in the fifth row. Holmos.

THIRD TYPE. A wide jar with cylindrical neck and narrow foot. In the third



Plate 55. Syrian blown and moulded flasks. Basket patterns, *b, c*, 1st century B.C. to 1st century A.D. Mrs. W. H. Moore Collection. Metropolitan Museum, *a, d*, the latter with lettering, of uncertain date.—See pages 271, 609.



Plate 56. Ennion blown and moulded types. The upper one is signed. 1st century B.C. to 1st century A.D. Metropolitan Museum.—*See page 271.*



Plate 57. Ennion six-sided amphorisk. 1st century B.C. to 1st century A.D. Metropolitan Museum. A moulded cantharus is seen on the front side.—*See page 271.*



Plate 58. Sidonian pyxis of ivory paste glass with life symbols. 1st century B.C.—*See page 272.*

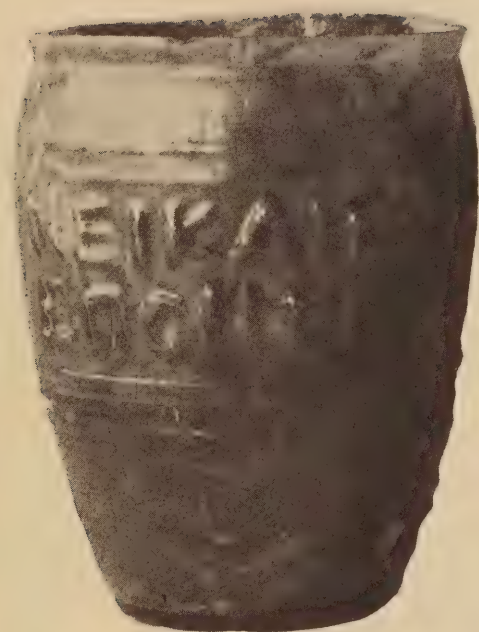


Plate. 59. The Neikais glass goblet. 1st century B.C. to 1st century A.D. Fahim Kouchakji Collection.—*See page 272.*



Plate 60. Syrian and Cyprian victory cups and goblets, 1st century B.C. to 1st century A.D. The three larger cylinders are Sidonian, Mrs. W. H. Moore Collection. The smaller ones from Cyprus, Metropolitan Museum, are of greenish glass.—*See pages 273, 274.*

row the body is fluted, but this is an isolated and unique occurrence. The vase holds fruit or loaves.

FOURTH TYPE. A tall, slender wine or oil flask, but slightly varied in the different specimens but most generally, like the one in the two lower rows, each pitcher has a spout.

FIFTH TYPE. Jar with narrow neck, and low narrow foot-stand. Holmos.

SIXTH TYPE. Pitchers with more or less distinct spout, more or less repeating the fourth type.

Artistically and archæologically these types are of interest on account of their date. All of the 1st century B.C.

ATTEMPT AT IDENTIFICATION. In a general way these vases must be such as were used in the Bacchic rites or in those of the Sidonian Ashtoreth. At least one of the vases can be shown to have been in use several centuries before the time when the temple series was made. This is the "holmos" used in the Eleusinian rites, as seen depicted on the scene with the idol standing on the table or altar. On each side of Bacchus stands a holmos vase of the same form as represented by the heavy, two-handled vase on the flask. Female attendants are in the act of mixing the wine, one pouring it into one of the two flasks or jars, the other one dipping it out by means of a trulla. Compare: Daremberg et Saglio, Fig. 2424, under Dionysios. Also Museo Borbonico, XII, Pl. XXI.—Fig. 114.



Fig. 115. Sidonian, temple series type with six represented vessels in proper sequence.

SIDONIAN FLASK OF THE TEMPLE SERIES

Height, 3.13"; neck, 0.95"; neck from top to mould mark, 0.8"; base ring, 0.9"; rim, 0.8"; body from base to top of arch, 2". 1st century B.C. Mrs. W. H. Moore Collection.

Material, bluish gray ivory paste glass, blown in mould consisting of three parts. Decorations produced in the carved mould represent six arches resting on Doric columns, and under each arch stands a temple vessel, probably in the manner seen in this particular temple. Found in Syria.—Pl. 50, center.



Fig. 116. Sidonian, Ornithopolis series with storks.—In the center sits the guardian, announcer or augur.

TEMPLE VESSELS WITH LOAVES. Average height about 3.3"; diameter about 1.6".

Made of ivory paste glass as well as translucent glass. The principal difference between this sub-type and the former is that one of the canthari is filled with three loaves, and that the two canthari are separated by two other vessels instead of by one only. For the forms see Text Fig. 114. The one measured is based upon the whirling-square rectangle, the body up to the tympanum occupying an exact square. Syria. 1st century B.C.—Text Fig. 115.

FLASKS WITH LOTUS-CUP BASE AND RELIEFS OF RITUAL OBJECTS

These types are characterized by having a petaled lotus-corolla base and in this differ from the temple series proper, in which the base is decorated with garlands, cones and grapes. The decorations are separated by columns which divide the body into six fields, each with a symbolic object or other representation.—Pl. 52. This series contains various varieties, the following being the principal ones: Nesting birds and a seated guardian. Storks with nests of pottery vases. Ornithopolis flasks, Fig. 116; nesting birds without guardian, Fig. 117; processional objects, vases, thyrsi, patens, jewel shrines, Fig. 118. Always with handles, larger than the temple series. Jewish (?) symbols of trees of life, vases, fruits of the tree of life and a letter, Fig. 119. Palestia objects, vases, rings, wreaths, scrapers, Fig. 120. Isis and Bacchus symbols, pine cones, pomegranates, grape clusters, Fig. 121. Anthe-

mia and trees of life, possibly Jewish, Fig. 122. Etrogs or ceremonial lemons, zigzag wave on base, Fig. 123.

ORNITHOPOLIS FLASKS WITH DECORATIONS OF BIRDS. Average height about 2.9"; diameter, about 1.6". Made of ivory paste as well as common glass. The



Fig. 117. Sidonian, Ornithopolis series, nesting birds, mould indistinct.

moulding in all specimens seen is very poor and it took considerable study to discover that the reliefs represent birds, flying over or resting on nests, just as do the storks in certain parts of Europe when the population is intelligent enough to value their society instead of brutally hunting them. Some of these nests resemble pots, and lead us to assume that special pottery vessels were placed on the houses in order to facilitate the nesting. One of the figures resembles a seated guardian of the birds.



Fig. 118. Sidonian, represented objects in the processional series.—Jewel box, *c*—sacri-
ficial plate, *d*—crossed thyrsi or torches, *f*.

The base of the flasks of this series is always fluted or petaled. The series, therefore, belongs to the large group in which this characteristic is of importance. Above and on the sides of each tympanum is a spherical object, an egg, a fruit of life or some other object not yet interpreted. Syria, 1st century A.D., possibly sacred to Ornithopolis, a town near Sidon.—Text Figs. 116, 117.

SIDONIAN FLASKS WITH PROCESSIONAL OBJECTS

About 3.5" high, larger than the temple series, from which these flasks differ in always possessing one handle; the shoulder and base are petaled. The form is rounded, six-sided, each side separated from the other by an upright bar without



Fig. 119. Sidonian flask with life symbols.—Probably a letter, *f*.

capital or base. Matrix is generally translucent, brightly colored blown glass. Blown in moulds with three parts. The flasks are generally based on the dynamic symmetry, which includes both body, neck and handle, all having been included in the mould. The decorations are as follows:

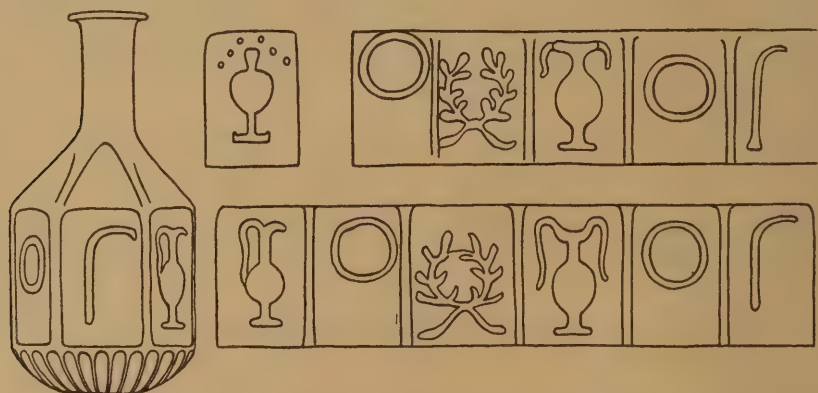


Fig. 120. Sidonian bottle with palestra objects and prizes, vases, rings, wreaths, scrapers.

FIRST SIDE. Crossed thyrsus staffs; also identified as four torches held together so as to form a Greek *chi* (Stephani: *Compt rendu de la Commission archéologique de St.-Petersbourg*, 1859, p. 91), "bacchus staffs" (Harrison: *Themis*, p. 200, Fig. 51; left

“kourete” holding the four torches). See also the Cumes vase, Daremberg et Saglio, Fig. 2639. Some have also been identified as scepters, and Kisa describes them as “double flutes” (p. 717). They often occur with a spray of poppy heads placed in the form of a bar across the center.—Fig. 118, *f*.

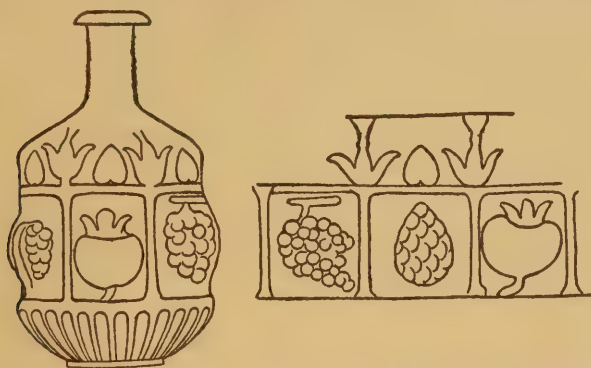


Fig. 121. Sidonian bottle with grapes, pine cones, pomegranates, pertaining to the rites of Bacchus and Isis, separated by lotus stalks.

SECOND AND THIRD SIDES. Each with a vase. The vase on side three is repeated on side six.—Fig. 118, *a, b, c*.

FOURTH SIDE. Poorly modeled objects best identified as jewel case or box. A Pan's pipe has also been suggested, but the bars are only four, thus clouding the identification. Such jewel boxes are often represented on Eleusinian reliefs together with thyrsi, vase, plate, oxheads, etc.—Fig. 118, *c*.



Fig. 122. Sidonian bottle with life symbols, possibly Jewish.

FIFTH SIDE. Object a circular plate to hold the sacrificial meat. As similar plates are highly ornate, they can not be cymbals.—Fig. 118, *d*.

SIXTH SIDE. A vase similar to that on the third.—Fig. 118, *e*.

SIDONIAN FLASK WITH POSSIBLY JEWISH SYMBOLS. Flask of size and make similar to the Greek series with torches, but without shoulder corolla. The

arches are rounded and the base of the tympanum decorated with row of circles or bosses. The decorations seem to be Jewish, as we find by comparing them with the undoubtedly Jewish symbols of the 4th century glass. (a) Vase; (b) sacred tree; (c) undetermined, possibly a "lulab"; (d) almost identical with the lulab representations of Jewish 4th century glass; (e) sacred plant; (f) unknown letter.

This type is all the more interesting because but two certainly Jewish flask types are known from the Sidonian period, one being the pyx with the scroll of the Law. The sequence is always the same, but the symbols are subject to change. For instance, the vase is represented with or without cover or drinking cup.—Fig. 119. The other Jewish type is the one with the etrogs.

SIDONIAN SIX-SIDED FLASKS WITH PALESTRA OBJECTS. Height about 3.5"; diameter, about 1.65". Fig. 115, *a, b*, belong to different vases.

A well defined type with petaled base; six sides, and an object pertaining to the palestra or gymnasium in each field. We can recognize two (gold?) rings, a wreath, a

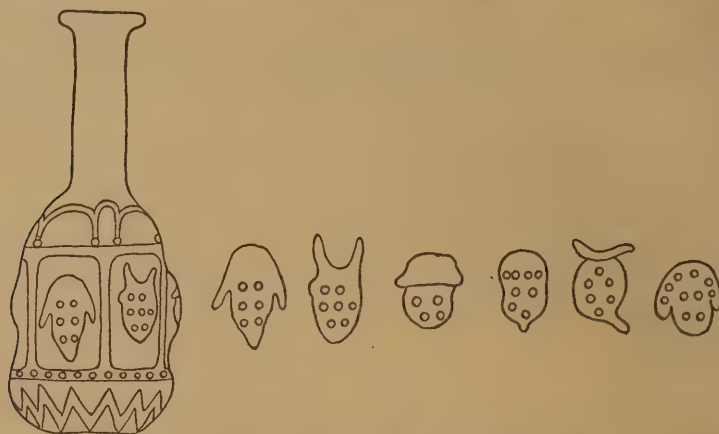


Fig. 123. Sidonian bottle with Jewish etrog citrons, in Syrian called Kabad, meaning livers, on account of their variable and curious warty forms.

scraper, and two vases. Others are similarly decorated with vases possessing respectively one or two handles. Matrix in these flasks is either brown or violet, as far as we know.—Fig. 120.

FLASKS WITH FRUIT TREES AND WREATHS

A well defined type as regards the decorative symbols, which are alternating pine cones, grape bunches, and pomegranates, one in each field. The base is petaled either with pointed or rounded petals. The shoulder is decorated with arched tympani, each with a cone or conelike flame, too indistinct to be identified. The symbols refer to Isis and Bacchus. Between the arches of the tympani are floreate or birdlike, indistinct objects. Strange to say, this type is described in the Jewish

Cyclopedia and in treatises on Jewish archeology as "Jewish," because found in Palestine. Some are made of ivory paste glass and undoubtedly belong to the 1st century B. C. (Gerspach: *L'art de Verrerie*, Paris, 1885, p. 78, Fig. 35. N. Y. collection.) One is in the Curtis-Libbey Collection in Toledo. One figured by Kisa is from the Sambon establishment in Paris. Superb ivory paste glass.—Fig. 121; Pl. 52.

SIDONIAN BOTTLE WITH ANTHEMION-LIKE TREES OF LIFE

The type without handle is based on one square plus a half a square. The six sides each contain a floreate design, twice repeated. The two major designs are twice repeated on the shoulder. There is a neck mark at the end of the mould. From base to shoulder line is a square, from that line to the neck mark is half a square. The diagonals of the whole cross on the median line, on which line the arches also rest. Six arches, alternating curved and angular. Base with three concentric elevated rings, and a small central boss. Thirty fluid arches, or petaled corolla, at the base. White opaque ivory paste glass. Height 8.4 centimeters. Syria.—Fig. 122.

SIDONIAN FLASK WITH JEWISH "ETROGS"

The form is related to the temple series. Each of the six sides or fields is occupied by what appears to be a fruit. The only fruit with such variations, full of irregular depressions and warts, the whole varying greatly in form, is the well-known etrog used in Jewish churches and in rites at a certain festival of the year. The moulded reliefs are very poorly executed and the form difficult to recognize. Etrogs are common on Jewish gold-glass of the 4th century A.D. Metropolitan Museum and Curtis-Libbey Collections.—Fig. 123.

SIDONIAN FLASKS WITH HORIZONTAL WREATH

This type belongs to the "processional" series, possessing the same concave sides, with projecting shoulder and petalled base. The decoration occupies the whole central field and consists of a laurel or ivy wreath made up of two branches, joined at their bases and meeting on the opposite side of the flask with their tips. Laurel or ivy fruit sometimes alternate with the leaves. Some are of violet-brown, others of deep blue or even uncolored glass. Metropolitan Museum and the Curtis Collection.—Pl. 52, *e, g*.

SIDONIAN FLASK WITH WREATH. Flasks with petaled shoulder collar and base. The three moulds are separated by thyrsus columns supporting a horizontal central tree and wreath. Stars and some other minor decorations. Kisa, Fig. 266, p. 717.

THE ARGONAUT FLASK

Height, 2.3"; diameter, 1.5". Mrs. W. H. Moore Collection. 1st century B.C. Syria. A most interesting type until now known in two specimens, the best of which is in

the Moore Collection. It is made of yellowish amber-colored glass entirely covered with a snow-white, heavy patina, which, however, is not thick enough to obstruct the relief. The design is divided into two parts, one on each side of the rounded body, each corresponding to the half of the mould. On one side is the grove of Ares with a tree, resembling a laurel with oblong leaves and rounded fruit. On a branch hangs a water canteen. Below, on a rock, evidently near the shore, sits Phrixus in the act of holding the ram with the golden fleece preparatory to its sacrifice. Below are indistinct objects, possibly rocks and the sleepless dragon. The other scene represents the ship Argo, with a central upright mast, the sail drawn up to the top spar, from



Fig. 124. The Argonaut vase, Mrs. W. H. Moore Collection. Development of design. Phrixus and the golden ram in the grove of Ares. The vessel Argo.

which descend, to right and left partly crossing each other, long, straight ropes. At the bow of the ship stands Jason ready to jump ashore. In his right hand he holds a round shield, in the left a club or other indistinct object. In the stern sits the helmsman, designed on a much smaller scale. Below the vessels are horizontal crests of waves, a fish and an unknown object.

The design is spirited and could only have been made by a Greek. The top of the bottle was broken off in antiquity at the center of the neck, which must have been twice the size and furnished with a lip rim and perhaps two handles like the other, but inferior, specimen known.—Fig. 124; Pl. 53.

SIDONIAN FLASKS WITH GEOMETRIC DESIGNS. These flasks are related to the processional series. The shoulder with a petaled collar and the base with a similar but upright corolla. The central decoration consists of a continuous band of joined lozenge-shaped fields. The mould is of two parts. Handles are generally made of ivory paste glass, but the make of the whole is not equal to the temple series.—Pl. 55.

SIDONIAN FLASKS WITH CENTRAL VINE SCROLL. With one or two handles, generally of ivory paste glass. Shoulder collar of long narrow petals; base with corolla of upright petals. The central decoration consists of a continuous vine or of tendril scrolls.—Pl. 54.

SIDONIAN FLASK WITH BASKET DESIGN

Height, 3.6"; width, 1.75". Mrs. W. H. Moore Collection, 757. 1st century B. C.—Pl. 49.



Plate 61. Moulded Syrian gladiatorial and victory vessels. The cups with gladiators, from Gaul, Metropolitan Museum. The central flask, from Syria, Fahim Kouchakji Collection. 1st century B.C. to 1st century A.D.—See pages 274, 275.



Plate 62. Vessels from Pompeii. 1st century B.C. to 1st century A.D., *a, b, c, e*; the large silver cup is from the Boscoreale find. Louvre. *See pages 213, 278. For d, p. 289.*



Plate 63. Blown and moulded beakers and goblets from Pompeii, *a-c*. From Syria, *d*.—See pages 290, 293.



Plate 64. The five upper flasks from Cagliari (Sardinia) Museum; the rest from Tripoli, Tripoli National Museum. Photographs from Professors A. Taramelli and Barthollini. 1st century A.D.—See page 314.



Plate 65. 1st century A.D. glass vessels from Tripoli, Africa. Photographs by Professor Barthollini.—*See pages 292, 314, 359.*



Plate 66. 1st century A.D. glass vessels from Tripoli, Africa. Photographs by Professor Barthollini.—*See pages 292, 314, 449.*



Plate 67. 1st century A.D. glass vessels from Cagliari (Sardinia) Museum. Photographs by Professor A. Taramelli.—*See pages 278, 292, 314.*



Plate 68. Glass vessels with gutta drops. 1st to 2d century A.D. Mrs. W. H. Moore Collection. Syrian.—*See pages 293, 313, 317.*

Slender flask of translucent uncolored glass. The whole body is ribbed, decorated to appear braided or woven, the only other decoration being girdle or wreath of laurel with leaves and fruit. The form is oblong, pear-shaped with added handle. But few specimens of this type are known.—Pl. 55.

FLASK WITH PEAR-SHAPED BODY AND FLOREATE DECORATIONS. A Sidonian type related to the flasks decorated with basket design. One or two handles. Body moulded. Base with corolla of arches, two horizontal central bands of circular bosses, and between them connected broad bands of ivy scrolls with groups of three balls, like the fruit-of-life symbols. On the shoulder leaping dogs or other animals. Matrix greenish translucent glass. 1st century B.C. to 1st century A.D.—Pl. 55.

ENNION AND OTHER SIGNED SIDONIAN GLASSES. To the Sidonian period belongs a series of signed glass vessels of small size but with artistically moulded decorations and of delicate form and proportions, indicating Greek or Greco-Syrian origin. Many of these vessels have been discovered in Gaul and Germany and investigators have on that account been attributing them to native artists and artisans, without considering that the very same types have also been found in Syrian, Italian and African tombs. The circumstance that the majority of the vessels are made of the same or related types of glass matrix, not found in other glass vessels, upholds the theory that these vessels were imported into Germany and Gaul from some other place of manufacture.

The glass matrix is mostly dull yellow or greenish, but sometimes also fine blue, some even of ivory paste glass, which could never have been manufactured in western Europe, but which was a specialty of the Sidonians and Tyrians. The designs are decidedly Greek and must have been executed or planned by Greeks or Greco-Syrian artists.

The signatures are Greek as well as Latin, the following being the most common: *Artax*; *Neikon* (in time of Caligula); *Eirenaios*; *Meges*; *Philippus*; *Asinius Philippus*; *Eugenes*; *Zethos*; *Ennion*; *Neikaic*.

Only few of the glasses are entire; but from the fact that they show relationship in some points to the Sidonian vessels of the time of Augustus and Caligula it is safe to date the series to the Augustan era and influence, a period which included the latter half of the 1st century B.C. and the early half of the 1st century A.D.—Pls. 56, 57.

IVORY PASTE GLASS PYXIS WITH COVER—JEWISH EMBLEMS

Height with cover 3.1"; body proper 2.4"; diameter of cover 2.5"; of base, 2.2". Mrs. W. H. Moore Collection. 1st century B.C.—Pl. 58.

Made of ivory paste white opaque glass, blown in a mould. Cylindrical, with pointed cover, but with flat top. The top decorations consist of eight connected anthemias and three concentric rings of unequal thickness. The body is eight-sided, with four repeated symbolic and decorative designs, each placed between two columnar uprights with base and capital. Six of these compartments are covered with alternating pointed or rounded tympani. These designs seem to represent Jewish objects, from left to right:

Disk with partitions like the clefts in an orange. Probably represents one of the shewbreads said to have been kept in two piles or heaps on a table in the temple. The partitions are of unequal number, ten in one, eight in the other. In one the central boss is entire, in the other it contains a cavity.

Anthemion, consisting of a central upright, two curved side leaves and a bow-shaped stand. Probably a life symbol derived from the Egyptian lotus, similar to those represented in mosaic glass, of which a text figure is given for comparison. Bud of Aaron's staff.

A lozenge-shaped four-sided shield with a central ring and a bossed center. At each angle is a knob. This figure does not stand under a tympanum like the others, but is higher and reaches to the very top of the columns. The same figure is found on 4th century glass flasks, where the writer assumes it to represent the book cover of the Old Testament, or the Old Testament itself. The design seems to represent the slightly opened scroll of the Law, one upper and one lower side picturing the upper and lower edge of the scroll, and the two other sides the rolled-up beginning and end of the scroll. This is not evident in this specimen but the writer has seen another in which two sides were thicker than the other and capped by a knob at both ends.

A candlestick. This interpretation is uncertain, but seems probable. The same design is found on Jewish gold-glass. There were two-armed candlesticks of silver in the temple. The form might have been derived from an Egyptian lotus symbol.

The lamp and the anthemion, nature symbols of light and life, occur on several Jewish monuments and especially on tombs in Palestine, and probably had reference to real objects seen in the temple. The Jewish nature of the symbols is determined by the lozenge-shaped object which, as stated, is common on the Jewish glass of the 4th century A.D. The pyxis was probably made by the same Greco-Syrian artists who made the temple series and the victory cups.

THE NEIKAIS RELIEF GOBLET

Height, 8.5 cm.; diameter, 6.8 cm. Owners: Fr. v. Gans, Frankfort a. M.; the Bachstitz Collection; Fahim Kouchakji. Pl. 59. From the necropolis of Beroia, at Aleppo, Syria. Uncolored glass covered with silvery patina.

Blown in a mould of two parts. The Greek inscription is in two parts, each of two words, one above the other:

MNHCΘH—remember
O ATOPACAC—the buyer

NEIKAIC—Neikais (the artist)
EIIHCEN—made it

Three of the four words are variants of the rule. Neikais is supposed to stand for Neikaïos; MNHCΘH is correct; EIIHCEN stands for EIIHCEN; O stands for Ω; and ATOPACAC is written by ENNION, who used the same formula, as ATOPAZON. It is supposed that the formula reads "Buyer! Remember Neikais made it." Two other goblets with the same inscription in varied spellings are known, but made by two different artists: One by Meges, found at Marium in

Cyprus, now in the Metropolitan Museum; and one by Iason, now in Cologne. The two parts of the inscription on these goblets, as well as on various other types, are separated by upright palm branches covering the joints between the moulds. The Neikais goblet is the most artistic of the three specimens known. The artist seems to have been Sidonian. Compare: Froeher, *Verre antique de la coll. Fr. v. Gans*, Paris, 1913; *Verrerie antique coll. Charvet*, p. 135; *Revue arch.* XXIX, 1875, p. 99, Paris; R. Zahn, *Coll. Bachstitz*, Vol. II, Pl. 60; Kisa, *Das Glas*, p. 708, 923, 967; Dresser, *Corpus inscr. gr. lat.* XV, 4; Colonna Ceccaldi, *Mon. ant. de Chypre*, p. 208, 708, 923-967. Letonne, *Recueil d. inscr. gr. lat. d. l'Egypte II*; Pedrizet, *Mem. Soc. d. antiquaires d. France*, LXV.

CYLINDRICAL VESSELS WITH CIRCUS AND VICTORY EMBLEMS.

These vessels comprise both cups and flasks. The body is cylindrical, moulded, some of pad-glass, others of blown glass. The decorations comprise circus scenes, victory prizes and emblems; triumphal objects; names and salutations. The quality of the glass is yellowish, greenish or ivory paste, the latter indicating a Sidonian or Syrian origin. Kisa enumerates twenty-four specimens of gladiatorial cups, the best bearing the names of gladiators known to have lived in the time of Caligula and Nero. The latest dated belonged to the first third of the 2d century A.D. Although these cups are generally labeled "Gallic" in our museums, there can be no doubt that they were made elsewhere and brought to Gaul with the Roman legions. The beakers found in Cyprus are mostly made of a special type of greenish glass not found in other vessels, but those of yellow glass are also known from that island.—Pls. 60, 61.

SIDONIAN CUP WITH ANTHEMION

Height, 2.15"; diameter of rim, 2.15"; of base, 2.3". Mrs. W. H. Moore Collection, 731.—Pl. 60, *a*.

Made of deep blue glass, blown in a mould consisting of two parts, in which the base was not included, but made separately. The mould was placed directly on the base, and the cylinder blown in it. The decorations consist of connected upright and reversed anthemion, each being based on a root-2 rectangle. 1st century A.D. Syrian.

SIDONIAN PYXIS CUP WITH COVER

Height with cover 2.5". Mrs. W. H. Moore Collection. 1st century A.D.—Pl. 60, *b*.

A very perfect specimen with entire cover, the latter decorated with a petaled corolla. The cylindrical body is blown in a mould, decorated with a horizontal wreath of laurel twigs, with alternating leaflets and fruits on slender stalks. Syrian.

SIDONIAN VICTORY AND SALUTATION CUP

Height, 3.1"; diameter, top 2.85"; base, 2.65". Mrs. W. H. Moore Collection, 736. 1st century A.D.—Pl. 60, *c*.

Made in three parts, base, body, rim, fused together after moulding. Decorations

were produced by a bubble-blown cylinder in a mould. The mould is in two parts, the joints representing upright trees with some branches at the top. Above the center is a wreath of palm leaves with olive fruits on stalks, diverging from uprights but meeting at the centers between them. Along the base runs a diagrammatic wreath of the same type but without berries, all the leaflets being parallel. The central device reads: "Rejoice and cheer up," a not uncommon exhortation on such vessels. KATAXAIPE KAI EYΦPAINOY—Good cheer and be happy.

The matrix, in conformity with most similar cups, is of translucent slightly greenish glass. The mould is based on a root-3 rectangle with some interior coincidences. *BEAKERS FROM CYPRUS*. Several small beakers are in the Cesnola Collection in the Metropolitan Museum. Their form is cylindrical; a slight base rim; sometimes also a lip ring; decorations are simple and not very artistic, consisting of upright sprays of broad leaves and scrolls with central leaves, bunches of grapes and other objects. The matrix is greenish, of a peculiar quality not duplicated in ancient glass from other places.—Pl. 60, *d-g*.

CIRCUS CUPS WITH GLADIATORIAL AND CHARIOT SCENES

These cups are characterized by being cylindrical and by being made of a special kind of yellowish and greenish glass matrix, not found in other types. This suggests that they were made in certain localities and by a few families of artisans. The delicacy of the design, the fineness of the matrix and the proportions place them in a class with the victory cups, and point to Syria, and especially to Sidon and Tyre, as place of making.

Most, perhaps all, authors refer them to Gaul, without taking into consideration the fact that cups of this type are also found in Syria and Italy and that it would be unlikely that persons living in Gaul would have been interested in the Roman gladiators unless they had seen them. This leads us to assume that the cups, instead of being made in Gaul, were brought to Gaul by Roman soldiers in the period including the whole of the 1st century and the first half of the 2d century A.D. According to the decorations we can distinguish the following types: gladiatorial contests with fallen and victorious combatants; chariot races; and cups with victory emblems and names but without human figures. All the specimens known in the time of Kisa are enumerated by him, pp. 726-751. One of the finest specimens is in the Sangiorgi Collection in Rome.—Pl. 61.

NAMES OF FIGURED GLADIATORS AND CHARIOT RACERS

Columbus, a mirmillon in the time of Caligula, was vanquished by Thrax and afterwards, when recovering, had his wound poisoned by the emperor.

Columbus, another gladiator, lived under Nero.

Columbus was also the name of a gladiator overcome by Spiculus.

Eutychius was a quadriga-driver in the time of Caligula, and rewarded by the emperor with two million sesterii.

Proculus, lived also in the favor of Caligula, but was later executed by him. His name occurs in the gladiatorial armory of Pompeii.

Spiculus, lived in the time of Nero, became a favorite of the emperor; later executed by Galba. The name occurs on the walls of Pompeii.

Tetraites, vanquisher of Prudes, was represented on the beaker of Trimalchius.

Prudes or *Prudens*, was a gladiator vanquished by *Tetraites*.

Hermes, is mentioned on the walls of Pompeii, lived in time of Nero.

Hermas, another gladiator is mentioned many times by Martial.

Crescens, lived in the beginning of the 2d century A.D.

Petraites, is assumed, but with question, to be identical with *Tetraites*.

Merops, Hermes, Prudes and Columbus were vanquished by Gamus, Calamis, *Tetraites* and *Spiculus*. Of the less famous champions the names Ierax, Olympie, Antiloce, Crescens, Pyramus, Holes, Cucumbus and Aemilius are mentioned. To many names the letters "va" are appended, as for instance "Gamusva," which makes it probable that these letters stand for *vale*, meaning *bail!* One of the cups on which the champions *Petraites*, *Prudes*, *Ories*, etc., were recorded was found in Oldenburg. It was signed by the maker M. CICINIUS DICEUS. The misspelling of names would seemingly indicate that they were not made in the city where the contests took place. The art of the cups is with certainty related to that of Sidon, Ennion, the Arretine ware, etc., of the 1st century A.D. The same matrix of yellow glass is also found in Syrio-Sidonian glass of the 1st century A.D., but not in Gallo-Roman of that period.

CYLINDRICAL FLASKS, NARROW CYLINDRICAL NECK. The moulded decorations are Greco-Roman. The anthemion and the garland, often separated by columns, are favorites. These types are continuations of the temple series of the pure Sidonian styles, but show Roman influence with more practical form and heavier matrix. The flask in Breslau Museum, Kisa, Fig. 269, belongs here. So does the beautiful Syrian flask.—Pl. 61. Fahim Kouchakji Collection.

BULLÆ OR HAND FLASKS. By Kisa called Pilgrims' flasks. The form is circular compressed, moulded in two half moulds. Necks narrow; two or more minute handles. The body is always circular and compressed from front to back. We can separate several distinct types. Front and back moulded with so-called Bacchus heads. Front and back moulded with a large star, or rosette. Front and back decorated with concentric rings, central boss, etc., surrounded by angular fields like the faces of a cut stone. The matrix is variously sherry-yellow, violet, but also opaque white ivory paste glass, which latter would date them to the time of Augustus.—Pl. 54.

THE PRACTICAL USE OF GLASS DURING THE FIRST THREE PERIODS. The imperfect, though artistic, methods of manufacturing glass vessels during the first three periods of glass, made the production of large vessels difficult, and above a certain size, impossible. Hence the core-wound and the tube-blown glass was of a necessity restricted to articles of the toilet and the bath, or to ornamental trinkets; silver, gold and pottery being the usual table ware.

Of pad-glass we possess from that long period but heavy, clumsy and thick-walled cups and jars, which never could have been used extensively, lacking as they do decorations and artistic forms.

The tube-blown and the mosaic glass cups were used principally, if not exclusively, in the sacred rites, being too small and too delicate to be practical for the table. The precise time when glass vessels of proper size and lightness of weight were made for domestic use is not known, but as many thousands have been found in Pompeii, Tripoli, Sardinia and other first century A.D. localities, we can be certain that none was made before the time of Tiberius and Caligula, or much before the middle of the 1st century A.D.

PART IX. FIRST CENTURY A.D.: POMPEII, TRIPOLI, SARDINIA, SYRIA

GLASS FOUND IN POMPEII

GLASS VESSELS FOUND IN POMPEII. The Museo Nazionale of Naples possesses the only well dated collection of 1st century glass vessels so far accessible. It is the only source we possess at present for a knowledge of 1st century A.D. glass and an approximately full series of outline drawings of these vessels should, therefore, be acceptable to the investigator. For convenience these figures have here been massed in approximately classified sequence of form. Besides those figured, the Naples Museum contains many more,

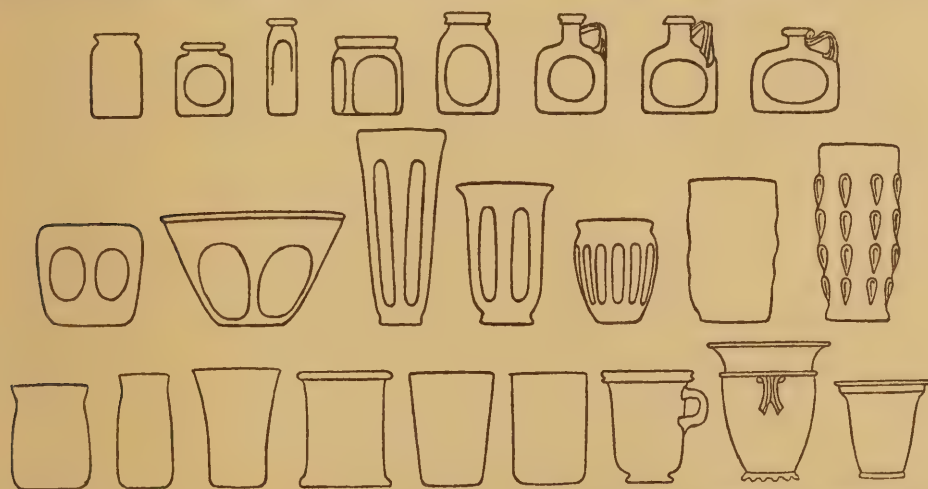


Fig. 125. Glass vessels from Pompeii, 1st century A.D., Naples Museum. Drawn after photographs taken by Sommer & Co. I, Jars and jugs; II, Beakers with moulded sides; III, Plain beakers, measures.

included in a collection known as the "Collection of ancient Greek glass vases," photographed by Sommer. Besides containing many types of the kinds described in the previous series, it also contains a few millefiori bowls undoubtedly of the Augustan era, and a Sidonian flask of the palestra series with horizontal wreath.

In addition to these vessels of undoubted antiquity, the collection includes a series of Venetian gutta glass, millefiori, and amphorisks with dragged pattern, some Persian and some 2d and 3d to 4th century vessels. The four urns illustrated in text Fig. 127, are from this collection. The remainder require for classification, personal access and the handling of the investigator. They must, therefore, be passed over without further reference.—Pls. 62, 63; Figs. 125–130.

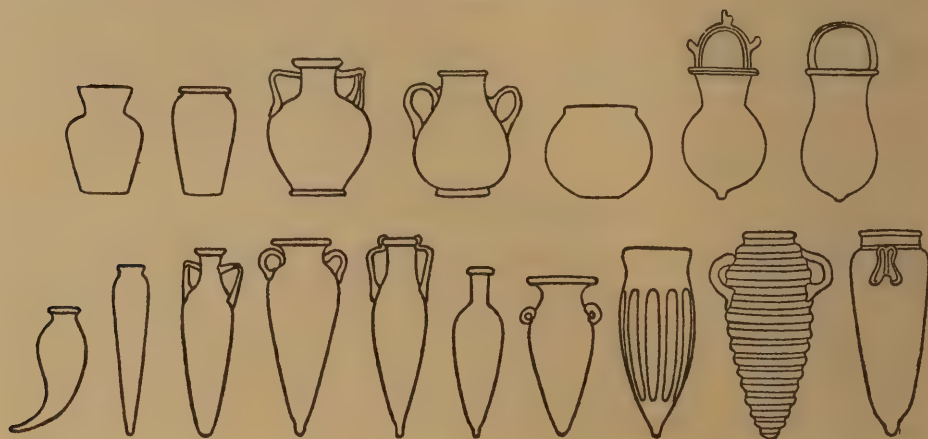


Fig. 126. Pompeian glass vases, Naples Museum. IV, Jars and jugs; V and VI, Amphoræ and amphorisks, hanging vessels.

CHALICES. The name “chalice” is given to many ecclesiastical vessels used in the holy rites, although it is evident that their form is derived from the cantharus and not from the calix. The latter derived from the corolla of the lotus flower. The name calix or chalice should, therefore, properly only be applied to vessels which recall the corolla of a flower, a vase of semispherical or truncate-spherical form. The Christian chalice type and form could not have been established earlier than the time of Constantine, and it seems probable that the early Christians used any kind of vessel for the eucharistic rite. Wilpert holds that the earliest chalice so far known is seen in the “measure” with two handles represented in the early 2d century crypt of Santa Priscilla in Rome (Wilpert, Pl. 15). Later the cantharus type was adopted; at least the majority of vessels identified as possible Christian chalices are of that type. We will return later to this subject when considering the 3d to 4th century objects.

THE CHALICE FORM OF THE AUGUSTAN PERIOD. The peculiar and characteristic form of a whole series of vases of glass, pottery and metal of the Augustan era is well illustrated by the two specimens reproduced on Pl. 62 from the Louvre collection of the Boscoreale find. The same form is found in the two Morgan cups, in the cup on the Arch of Titus in Rome, in cups on the wall paintings of Pompeii, in the Antioch chalice, in the Berthouville cups and in various other cups of the Augustan and Tiberian periods, but does not occur after the 1st century A.D. The form of the bowl part should be considered in the connection with the foot and stem and not



PLATE III. PITCHER OF BLUE GOLD AND WHITE STRATIFIED GLASS. AUGUSTAN
ERA. MRS. W. H. MOORE COLLECTION. SEE PAGE 229.



Plate 69. Paper-thin glasses with buckled sides. 1st century A.D. to 2d century A.D. Mrs. W. H. Moore Collection. Syrian.—*See pages 294, 295.*

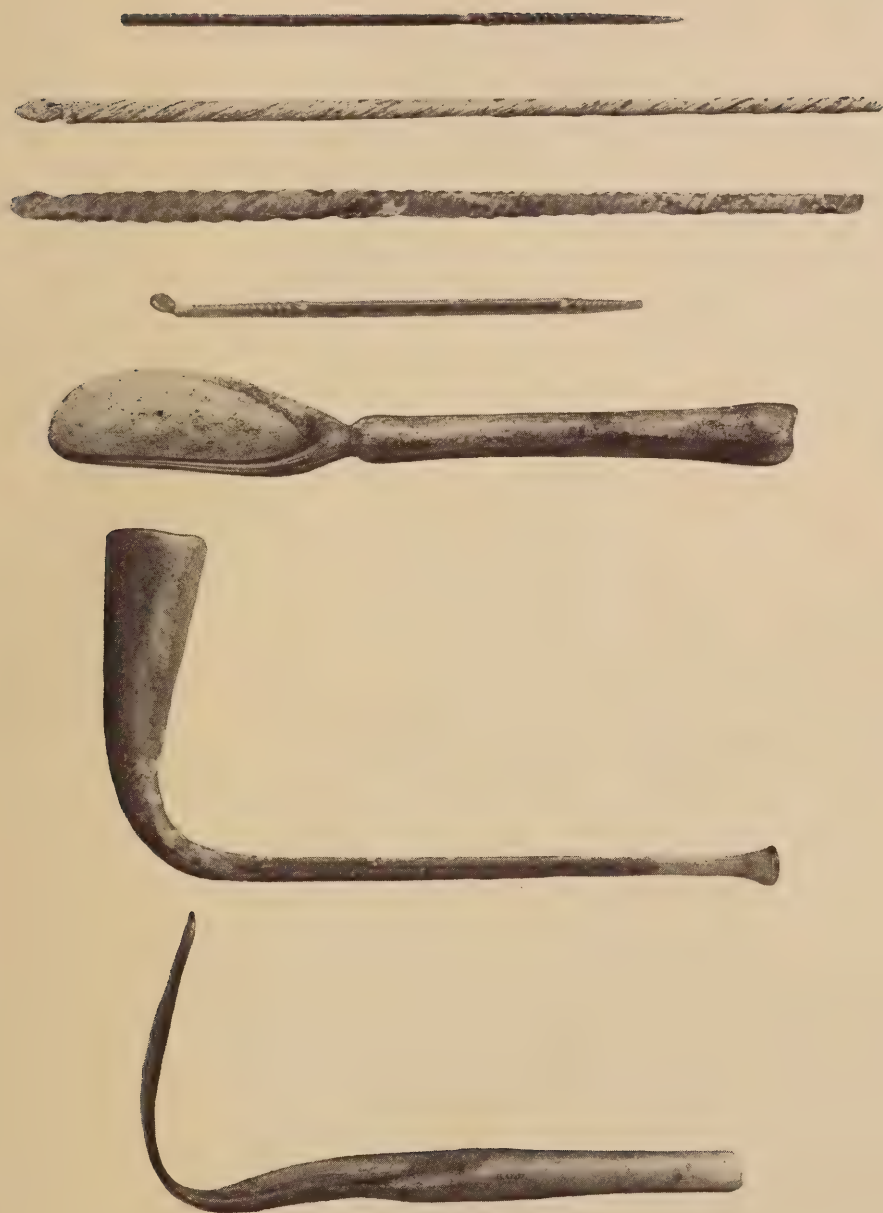


Plate 70. Implements of glass. Mostly from Pompeii. Metropolitan Museum. Stirrers, spoons, a pipe, scraper.—*See page 296.*



Plate 71. Two cups, Syrian types. Mrs. W. H. Moore Collection, *a*, *b*. A cup measure, finished by grinding, Brooklyn Museum, from Pompeii, 1st and 2d centuries. —See pages 296, 314.



Plate 72. Bowls blown and with moulded shields and honeycomb meshes. Syrian. 2d century A.D. Mrs. W. H. Moore Collection.—*See page 319.*

separately. The characteristic feature of all such vessels is the relative proportions of bowl and stem, not the form of the bowl, which varied within certain limits during the same period.—Pl. 62; Fig. 53.

MINIATURE CHALICE OF PLAIN GLASS. This little vessel of glass is of importance on account of its similarity in form to some chalices represented on the walls of Pompeii, to the two Morgan silver cups, to some of the Berthouville silver cups and to the Antioch chalice. Its technic is uncertain, but the fact that there is an inner accidental opening, the size of a large pin head, which connects with the nodus and stem, suggests that it is not bubble, but tube-blown. It is, however, very light weight and the walls are not very thick. Size 3.2" high. The foot is concaved inwards. Made of greenish uncolored glass with pearly iridescence. Probably a token or a ritual cup. Probably from Syria.—Pls. 62, 67.

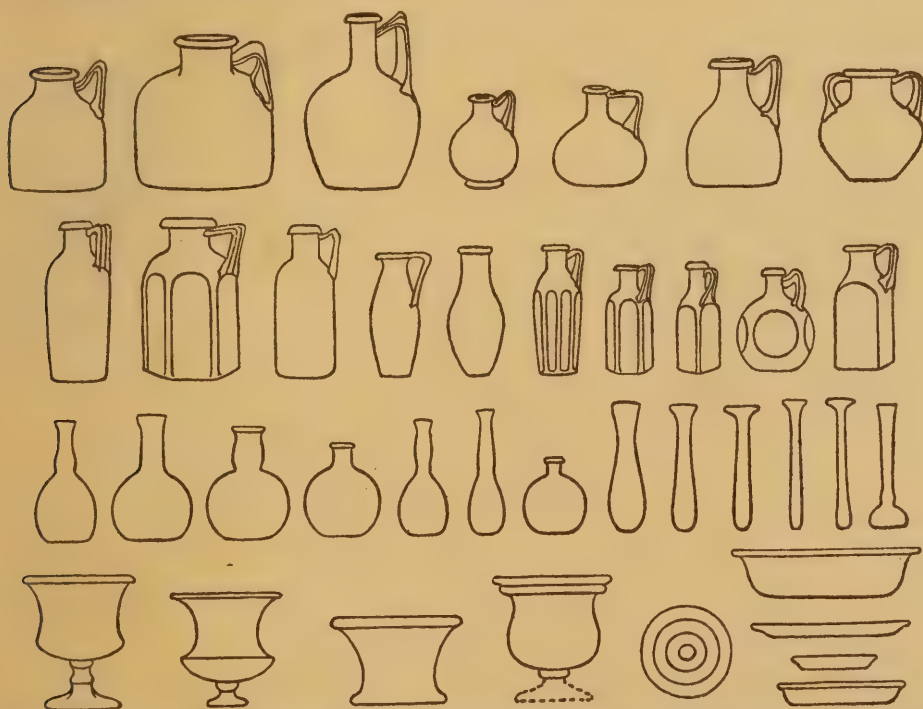


Fig. 127. Glass vessels from Pompeii, Naples Museum. VII, Various kinds of jugs; VIII, Lagonaria or water jugs; IX, Bottles and tubes—Lacrymaria or tear bottles—oil vials; X, Urns and plates.

BEAKERS OF THE FIRST CENTURY A.D.

These beakers are dated because they have been found in Pompeii, some in the actual place where they were used. We can separate several types according to the technic of the moulded decorations.

1. Beakers made of moulded pad-glass with decorations of spiral flutings, laurel

wreaths, bosses, vines and grape bunches with birds and other animals.—Figs. 130, 131. Pompeii. Pl. 63.

2. Bubble-blown moulded beakers with lotus buds, lotus seeds, petals in diagonal rows, etc. Fig. 131. Syria, Italy.—Pl. 60.

3. Beakers with applied decorations of lotus buds, lotus seeds, petals, rosettes, etc. Some of the decorations were moulded before application, others were hand-

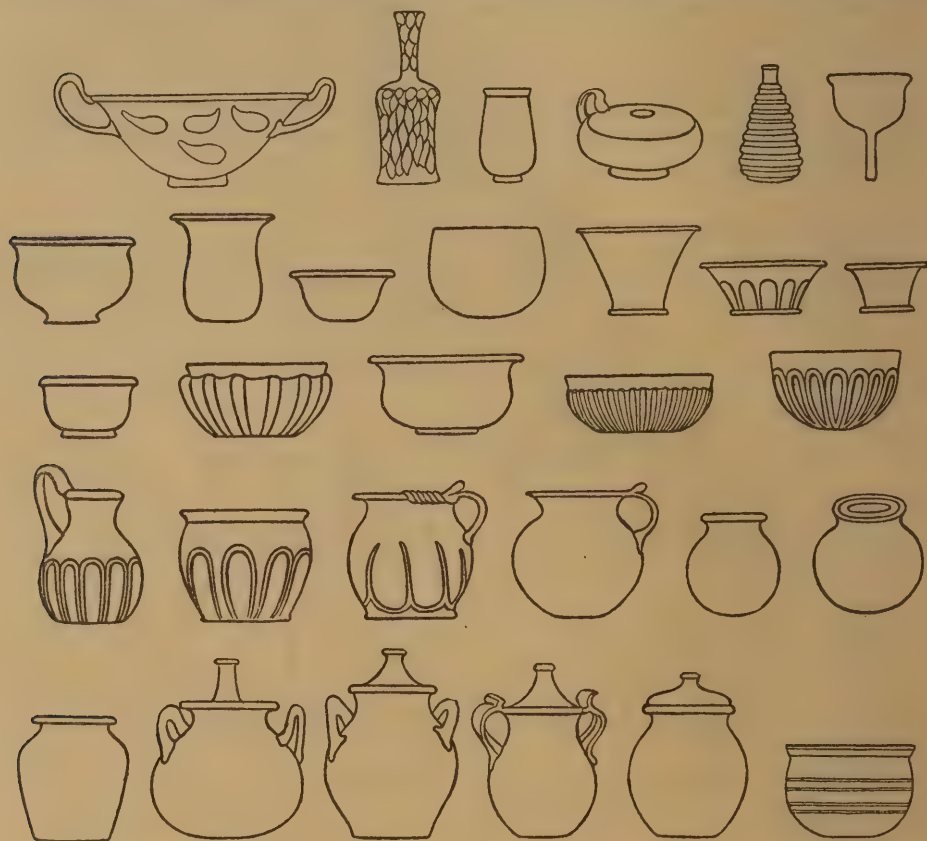


Fig. 128. Glass vessels from Pompeii, Naples Museum. XI, Cup, bottles, funnel; XII, Plain and moulded cups; XIII, Libation cups, lotus cups; XIV, Pitchers and jars; XV, Cinerary urns. The same types are found in Antonine tombs, probably being 1st century A.D., reused vessels.

formed. The date of the last series is not well defined. Kisa states that some were found in Pompeii. The type probably extended into the 2d century A.D.—Fig. 132.

Some of the beakers possess the peculiar moulded base so common in the 1st century A.D., others are without special foot base, or possess an applied foot-ring.

AMPHORISKS. Amphora-shaped flasks with or without handles have been found in Pompeii, Syria, Egypt and central Europe. There is no characteristic known by

which the dates can be determined with certainty. They are generally of glass of common quality and from four to six inches high. Those with upright diagonal and conspicuous thumb guides on the handles are not of the 1st century, but should be dated later.—Text Figs. 126, 133.

SIDONIAN IVORY PASTE GLASS AMPHORISK

Height, 3.7"; diameter, 1.7". Mrs. W. H. Moore Collection. 1st century, A.D.

Made of pale blue opaque ivory paste glass, of the same quality as found in some of the temple series and in the series with pomegranate and pine-cone figures. The

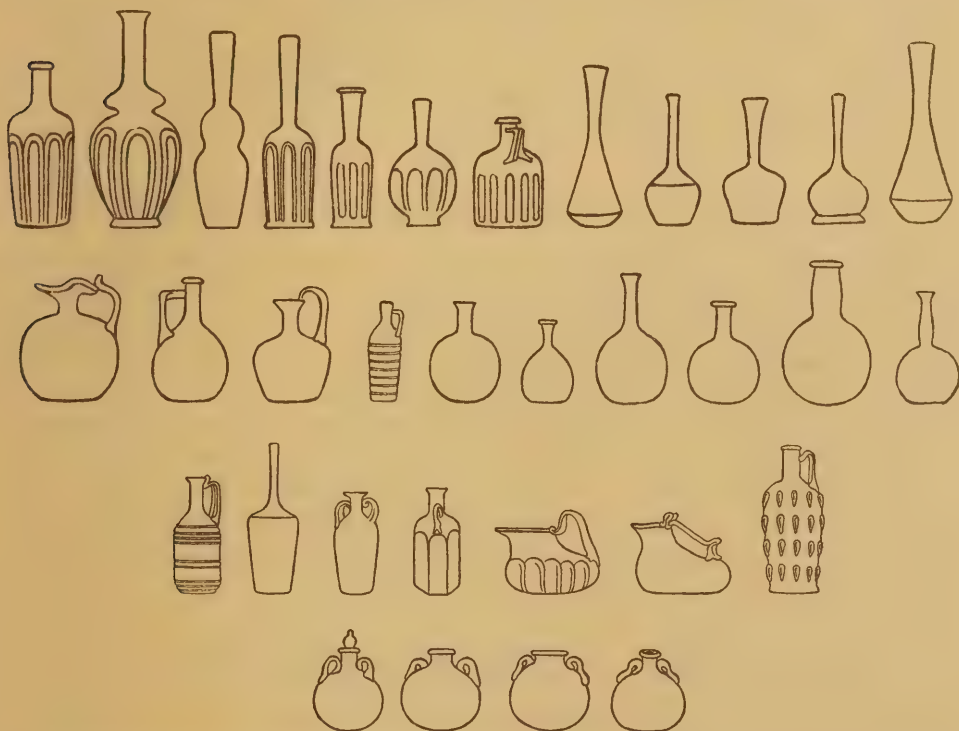


Fig. 129. Bottles and flasks from Pompeii, Naples Museum. XVI, Plain and double shoulder, carinated, more or less funnel-shaped mouth; XVII, Ampulla pitchers and flasks; XVIII, Engraved and six-sided flasks—askos flasks—flask with lotus buds; XIX, Pilgrim flasks with dolphin handles.

most interesting feature is the double-rim collar, which is of 2d century form. This circumstance throws some doubt upon the established theory that the double-lip collar was an invention of the 1st to 2d century A.D. and not in use in early Sidonian glass art. Even the upper surface of the lip is characteristically of the double-collar type with a concentric depressed ring separating the neck from the

applied collar. The collar part of the lip is flat, but the top of the neck is raised and rounded. Two small handles, as in the other Sidonian types, rest against the under rim of the collar. Undoubtedly from Syria.—Pl. 91.

TUBES AND DROPS

Throughout the 1st century we find minute tube bottles in the form of thin narrow cylinders gradually tapering upwards from a purselike body, generally widest at the base. Some have been found with coins of Claudius, according to Kisa, and others in Pompeii (Kisa, pp. 380–383). They occur in all collections and are principally interesting on account of their iridescence.—Fig. 127; Pls. 66, 67.

LOW RITUAL FLASKS. Candlestick type. These flasks are found in all the early centuries of the Roman empire, but so far no rules have been recognized whereby they may be classified with certainty. Fig. 137 with triangular body in cross-section, said to come from Pompeii.

AMPULLA BOTTLES OF BLOWN GLASS—BALL FLASKS

The ampullæ are pear-shaped or spherical bottles with a narrow conspicuous neck. They are plain or decorated, generally with spirally wound threads. The earliest have thin, delicately formed, funnel-shaped, but small, mouths gradually connecting with the neck. The later ones, in the 2d century and after, have a heavy flange rim around the neck as ending of the mouth. Those with the small, funnel-shaped necks seem to be confined to the 1st century A.D. The matrix is generally violet or blue, the decorative threads opaque white. They are found in Syria as well as elsewhere. The thread decoration was never extensively used until the 2d century and later, when the art of moulded decorations had degenerated in the hands of poor designers and bubble-blown had supplanted moulded glass.—Pls. 89, 90; Figs. 129, 138.

COMPRESSED SEMISPHERICAL AMPULLA BOTTLE

Height, 3.5"; neck, 1.7". Diameters: neck, 0.5"; bulge, 3"; base, 1.2". Mrs. W. H. Moore Collection, 677.—Pl. 90.

Decorated with one spirally wound opaque white thread. 1st century A.D.

PEAR-SHAPED AMPULLA BOTTLE

Height, 5.4"; bowl, 3.4"; neck, 1.85"; diameter, 3.1". Mrs. W. H. Moore Collection, 726. 1st century, A.D.

Made of thin, light bubble-blown violet-brown glass, now covered with a fiery and peacock-green patina and iridescence. Form pear-shaped, narrow neck slightly tapering to the base; at top a funnel-shaped lip. 1st century, A.D.—Pl. 90.

PITCHERS AND CENOCHOÆ OF BLOWN GLASS. One of the first types of vessels to be produced in glass for practical purposes were the wine and oil flasks. Those found in Pompeii had slender handles and neck, with delicately formed mouth and rim. Some rested on their own base, others had added foot-ring. In most instances the handles are round and sometimes even hollow. Some are decorated with superposed disks of Medusa heads. Those found in Germany, like the one from Hausweiler (Kisa, Fig. 201, p. 480), were undoubtedly imported from Italy or Syria.—Figs. 129, XVII, 136.



Fig. 130. Moulded beakers from Pompeii, Naples Museum.—With grapevines, birds and rabbits, as in the Antioch chalice.

UNGUENT FLASKS AND ARYBALLOS HAND BOTTLES. Round, spherical or compressed flasks, related to the “Pilgrim” flasks, used for unguents at the bath. Neck short, mouth wide, handles of the heavy type known as dolphin handles, used suspended by cords passed around the hand of the bather. Those with cup-shaped mouth are known as aryballos flasks, having been common in Greece. Made of moulded pad-glass, often decorated with engraved lines or moulded patterns. 1st and 2d centuries, A.D. In the 2d century superseded by “sprinklers.”—Fig. 134.

DOLPHIN FLASKS AND BOTTLES. Named after the form of the handles when present. Slender flasks with slender necks, cylindrical body or prismatic sides. The handles join base of contracted neck with top of shoulder. Or the flasks are circular, flattened, or spherical with extremely low neck and wider mouths. When the neck is tall it is truncate without rim. Some have the shape of cups and small bowls. 1st centuries, B.C. and A.D.—Text Figs. 129, 135.

PRISMATIC FLASKS WITH OR WITHOUT HANDLES

Flasks with four and six sides, low body and short neck, have been found in Pompeii. The handles are flat, thin and striped. Similar flasks have been found in Syria, Egypt and in central Europe. The latter probably belong to the 2d century. For the present we have no opportunity to separate the types and date them with precision. The earlier specimens seem to have shorter neck than the later ones. Some possess flat bottoms decorated with concentric, raised rings in relief.—Figs. 127, 140.

VASES OF BLOWN GLASS WITH GUTTA DROPS. This class comprises vases of various forms, some of pad-glass, others of thin blown glass, either colored or

uncolored. Their dates are not well fixed, but it seems probable that they belong from the 1st century B.C. to 1st century A.D. Their decorations are similar to those on the pad-glass urns, which with certainty date from the Augustan era, and the form of the amphorisks with gutta drops connects them with the later Sidonian vessels of the early part of the 1st century.

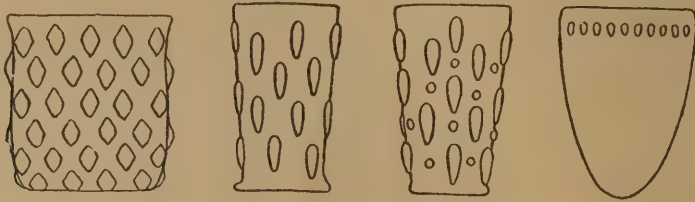


Fig. 131. Beakers with lotus buds from Pompeii.—Moulded decorations—Italy, Louvre, *d*.

The matrix is often violet-brown, but also fine deep blue or uncolored. The drops which are paper-thin, and drawn on the neck, are mostly opaque white, pale yellow, or ochre brown. Pale blue drops are rare. The forms include amphoræ with flat base without foot ring, Pl. 68, *b*; ball-shaped bottles with handles; cups with contracted



Fig. 132. Beakers with moulded lotus buds.—Pompeii, *a*, *c*—from Italy, now in the Louvre, *d*.

mouth region; and larger spherical amphorisks, like the fragment in the Terme Museum in Rome, Italy. The same forms are also found without drop decorations. Some of the amphora-type flasks possess a base drawn out in the manner of the stratified glass flasks, without additional base ring, a characteristic so far not found after the early part of the 2d century.—Pl. 68; Text Fig. 139.

PAPER-THIN GLASSWARE—FIRST AND SECOND CENTURIES

The main characteristic is that the matrix is light-weight and paper-thin to a surprising degree, entirely unknown in modern glassware. Another characteristic is that sides are buckled inwardly, sometimes a circular or oval buckle on four opposite sides, sometimes a horizontal row of buckles around the girdle of the specimen. But the most interesting fact is that similar vessels were also made with paper-thin walls, but of pottery instead of glass. Koenen mentions several, Pls. XII, 26; XVI, 10-13. They seem to have begun in the middle of 1st century A.D. and continued

during several centuries. The thinnest are from the 1st and 2d centuries, those of the 3d are thicker walled and heavier. The early ware is considered at present, the 3d century ware will be discussed later.—Pl. 69; Text Fig. 141.



Fig. 133. Amphorisks from Pompeii.—From Gaul, *e*, *f*.

PAPER-THIN BOTTLE WITH BUCKLED DEPRESSIONS

Height, 5.1"; diameter, 2.6". Mrs. W. H. Moore Collection, 682.

Made of paper-thin, uncolored, light-weight glass with twelve buckles around the girdle. Rather square body, narrow neck and funnel-shape mouth cup.—Pl. 69, *b*.

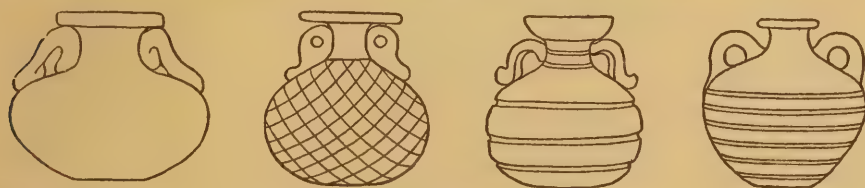


Fig. 134. Aryballos oil hand flasks with dolphin handles.—1st century A.D., *a*—2d century A.D., *b*—1st century A.D., *c*—2d century A.D., *d*.

PAPER-THIN BEAKER WITH BUCKLED DEPRESSIONS

Height, 3.6"; diameter at top, 3.2"; base, 1.93". Mrs. W. H. Moore Collection, 700.

Uncolored glass with violet-gray patina, mottled without iridescence. Foot flange one with the body.—Pl. 69, *a*.



Fig. 135. Prismatic and other unguent flasks, 1st to 2d century A.D., Syria, Italy, Gaul, Rhine valley.

PAPER-THIN GLASS JAR WITH BUCKLED DEPRESSIONS

Height, 3.3"; diameter, 2.6". Mrs. W. H. Moore Collection, 696.

Thin, light-weight manganese glass of violet color. Very dark brownish patina with some brilliant iridescence. These three vessels are probably from Syria.—Pl. 69, *c*.

STIRRING RODS, SPOONS, PIPES, SCRAPERS. An innumerable number of minor objects comprising needles, hairpins, ear-spoons, stirring rods, medicine spoons, pipes and scarabs are seen in museums and collections. They probably date from the time when glass was a novelty.—Pl. 70.



Fig. 136. Pitcher types of the Augustan era.—Pompeii, Hausweiler, Rhine valley, *a*, *b*.

CUP WITH CONCAVE SIDES AND DROOPING FOOT-FLANGE CUFF

Height, 2.6"; body proper, 1.85"; top, 4"; body at center, 2.9"; shoulder, 2.85"; base contraction, 2"; base ring or cuff, 2.4". Mrs. W. H. Moore Collection, 676.—Pl. 71.

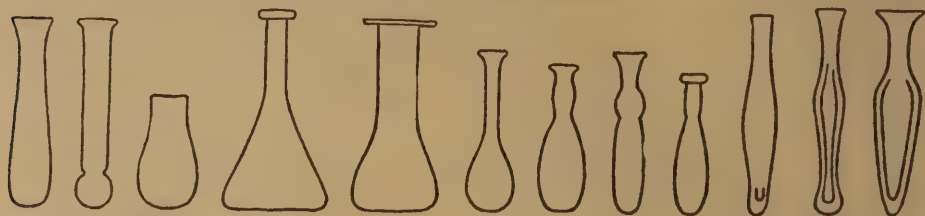


Fig. 137. Unguent tubes, 1st to 4th century.—1st century, *a*, *f*—2d century A.D., *g*, *i*—3d century, *j*, *k*—4th A.D., *l*.

Material: translucent light-weight green uncolored glass with green iridescence and green reflected light.

Form: a wide cylinder, with inwardly swung sides, widening slightly at the rounded base, which is concaved upwards, and set over a base ring, with drooping

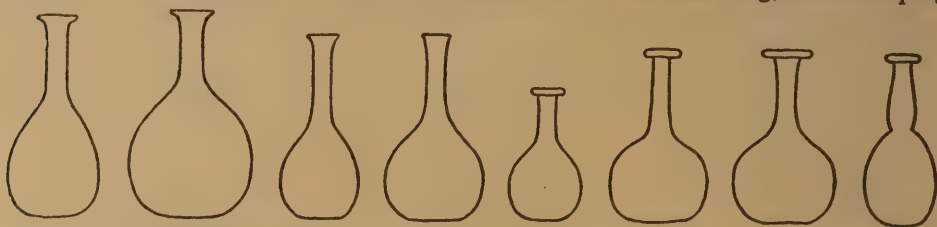


Fig. 138. Ampulla bottles, 1st to 2d century A.D.—1st, *a*, *c*—2d century A.D., Syria and Europe, *d*, *h*.

and sloping outline. The lip-rim is distinctly and conspicuously turned outwards and somewhat flattened on top. The central part of the interior bottom consists of a wide, raised ring and a less raised central boss, all beautifully finished.

The surface looks as if it might have been finished off by grinding. Claudian era.



Plate 73. Blown and moulded Caput cup with four heads of priestess or ritual masks. Syrian. Mrs. W. H. Moore Collection. Probably early 2d century A.D.—*See page 319.*



Plate 74. Caput bottles with Bacchus and Eros heads. 2d century A.D. Syrian. Mrs. W. H. Moore Collection, *a, b.*—See pages 329, 330.



Plate 75. Caput jar with faun head. Syrian. 2d century A.D. Mrs. H. O. Havemeyer Collection.—*See page 330.*



Plate 76. Caput flasks with Eros face, Syrian. 2d century A.D. Fahim Kouchakji Collection, *a*; Antiquarium, Berlin, Germany, *b*.—See page 329; Text Fig. 145.



Plate 77. Libation flask, with face of moon goddess. Syria. Fahim Kouchakji Collection. 2d to 3d century A.D. Syrian.—*See page 330.*



Plate 78. Naturalistic flasks, 2d to 3d century A.D., grapes, fish. Caput flasks, 2d to 3d century A.D. The date flask, center, Mrs. W. H. Moore Collection; all others Metropolitan Museum.—See page 330.



Plate 79. Grape flask and grape jar. Mrs. W. H. Moore Collection, *a*; Metropolitan Museum, *b*. Syrian.—*See page 331.*



Plate 80. Amphorisks, blown and moulded. Date uncertain, probably 2d century A.D. Mrs. W. H. Moore Collection, *a*; Fahim Kouchakji Collection, *b*, *c*; both violet brown glass, Syrian. Trèves Museum, deep blue glass, *d*.—See page 331.

FUNNEL-SHAPED CUPS WITH LOW BASE RING

The lip rim and the base ring are always low and narrow, generally quite flat, glass thin and delicate. The date is established by pottery of the same period, as figured by Oswald and Pryce, Pl. 51, Fig. 6, etc. Claudian era.

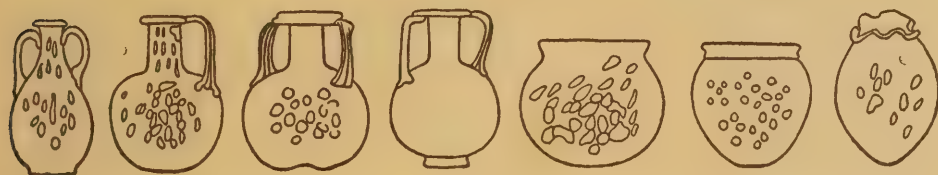


Fig. 139. Blown vessels with gutta decorations, 1st to 2d century A.D.—Antonine pottery (Koenen), *d*—Terme Museum, Rome, *g*.



Fig. 140. Prismatic cubic flasks from Syria, Italy, Central Europe, 1st to 2d century A.D.

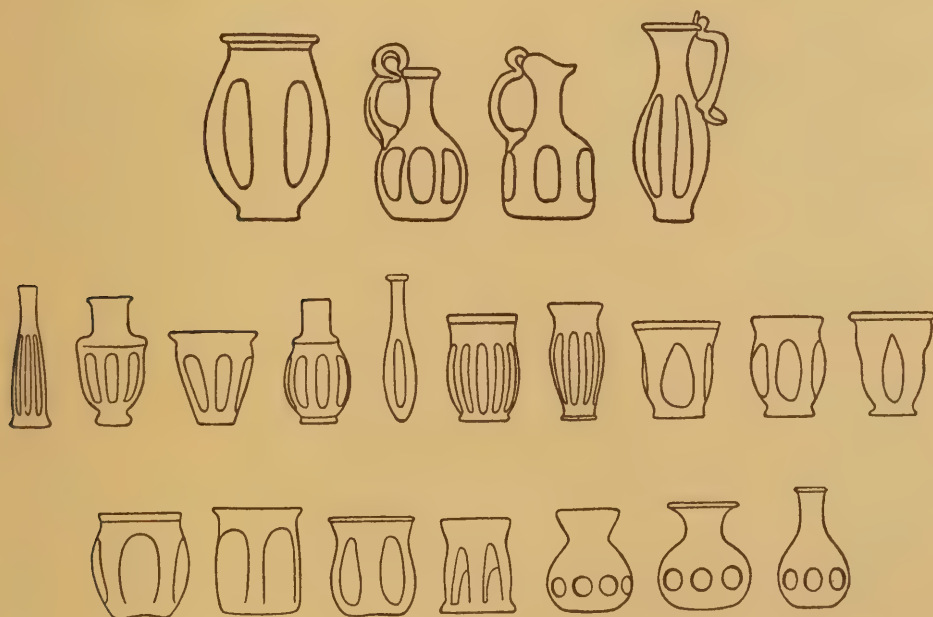


Fig. 141. Paper-thin vessels, 1st and 2d century.—Pottery after Koenen, XII, 26, *a*—the rest mostly from Cyprus, Italy and the Rhine valley.

FUNNEL-SHAPED CUP

Height, 2.28"; diameters: top, 4"; base ring, 2.35" to 2.4"; body above base ring, 2.1". Mrs. W. H. Moore Collection, 674.—Pl. 71, *b*.



Fig. 142. Measuring vessels, modius types, largest $4\frac{1}{2}$ in. high.—Brooklyn Museum, *a*
c—Syria, 1st to 2d century A.D., *b*, *d*.

MEASURES OF GLASS. Apparently made of pad-glass, of coarse matrix, generally tapering downwards, always with a loop handle. Probably measures for liquids, the Latin "modius." The form is apparently developed from the scyphus. All those examined by the writer came from Syria. There is quite a series of similar vessels in the Brooklyn Museum of Art as well as another in the Metropolitan Museum. The square ones seem to be earlier than the tapering. 1st century to 2d century A.D.; the absolute dates are, however, uncertain. In the text figure *b* and *d* are without question from Syria; *a* and *c* are in the Brooklyn Museum.—Pl. 71, *c*; Fig. 142.

CYPRUS, TRIPOLI AND SARDINIA

CYPRUS. The Cyprus glass is known principally from the Cesnola Collection in the Metropolitan Museum. The sizes are smaller than the Pompeian glass and seem mostly imported. The circus beakers of greenish glass, 1st century A.D., seem to have been made on the island.—Pl. 60.

TRIPOLI. A series of photographs of glasses from tombs in the suburbs of Tripoli shows types similar to those found in Pompeii, which are of 1st century A.D. date. They are characterized by a smooth sharp lip rim which, with Pompeian forms and the absence of mosaic glass, confirms the date. Tripoli National Museum. The types include beakers, cinerary urns, ampulla flasks, plates, crater urns, paper-thin glass and a few prochus flasks.—Pls. 64-67.

SARDINIA. Photographs of glass from Tharros, Nora and Cornus National Museums, Cagliari. The Tharros and Nora glass dates from 5th century B.C. as proven by the famous necklace of glass beads, now in the Louvre. There are also various core-wound amphorisks and alabastrons, typical of that period. The core-wound specimens are poorly made and hence considered as imitations. It is more probable that they are importations from Egypt. The glass from Cornus is so similar to that from Tripoli and Pompeii, as to satisfactorily establish the 1st century date. The cinerary urns are practically identical in the three places.—Pls. 64-67.

PART X. THE SECOND CENTURY A.D. PERIOD OF GLASS

MAIN CHARACTERISTICS

THE periods of antique glass merge into one another and nowhere is this more in evidence than in the 2d and 3d centuries. Some types were continued from the 1st to the 2d century, others from the 2d to the 3d. In time these transitions of one type into another will no doubt be well known, but at present this is only possible with a few of the most conspicuous. Unfortunately the antique glass available for study, especially that from Syria, comes from robbed tombs in which the antiques were separated and scattered without any attempt at determining a date, for this was in most instances of no value either to the finder or to the collector.

On the other hand a separate treatment of early and late variations of the same types is apt to cause confusion and tedium until the variations have been fully memorized. Because of the uncertainty of some dates, it has been thought best to describe these variations and varieties in one general group. Thus the paper-thin ware of the 1st and 2d centuries and the Bacchus flasks of the same period are here all considered as one unit. The types in this period are larger in size, and more practical as regards form. At this time glassware is everywhere supplanting metal and pottery for household use, and so more attention is being paid to convenience and less to artistic quality.

Throughout the period there is an advance in the art of blowing glass from bubbles, with the result that the older pad-glass and core-wound glass technics are neglected. The mosaic glass is hardly ever used for vessels, but is retained for beads. The purity of the uncolored glass is increased and reaches its highest excellence in the 3d century. A great loss to this period was due to the neglect of the moulded glass. In the beginning of the 2d century fine types were still being produced in Syria, but the innumerable reproductions of Bacchus heads, grape clusters, fishes, shellfish and similar naturalistic objects rarely possess any trace of that artistic quality which we so admire in the Sidonian ware of the Augustan era.

The blue matrix retained its superiority, but the emerald green and the ivory paste glass lost their purity and never recovered until the time of Arab supremacy.

Not one single deep cherry-vermilion colored glass vessel has come down to us from the 2d century. Probably that art too, had been lost. No stratified glass was made in the 2d century, and as far as now known none afterwards. Cheapness, size, transparency, seem to have been the qualities most appreciated by the Romans and the world at large during this whole period. The greatest innovation consisted in the ever increasing use of glass-thread decorations with exaggerated designs. During



Fig. 143. Pottery vessels, 1st to 2d century A.D., after Koenen. XI, 15, p. 80, Flavian emperors.

the latter part of the period a new type of glass, called *diatreta*, appeared. This is admired today as the acme of technical glass-cutting, while subject to dispute with regard to the method employed for its production.

THE DOUBLE COLLAR RIM. While the double collar rim is common on 2d century glass, probably it did not originate in that century. In the Museum of Naples are two *patera* cups with double collar rim of the same exact form as those we find in the 2d century; in the Mrs. W.H. Moore Collection is a small *amphorisk* made of bluish ivory paste glass, also with a double collar around the mouth. It thus appears that it was in use previous to the 2d century; but while it is extremely rare in the 1st century, it is common in the 2d and 3d. Pls. 84-87, 91.

During this period many parts of the vessel were exaggerated. The mouth was

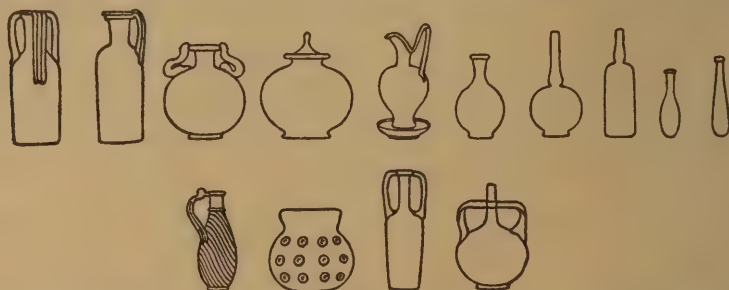


Fig. 144. I, Pottery and glass vessels from or near Cologne, Kisa, 372, 2d century A.D.; II, From Picardy, 2d to 3d century A.D.

made wider and funnel-shaped; the handles became larger and instead of connecting rim and body, connected body and the central part of the neck. The shoulder was emphasized, and bulges were added to the upper and lower part of the neck, or the shoulder was sunk so as to form a cavity around the neck instead of an even slope.

The neck steadily increased in size until it came to be out of all proportion and constituted a curiosity or abnormality.

MAIN DECORATIVE FEATURES OF SECOND CENTURY A.D.

THE GUTTA DROPS are not found with certainty after the beginning of the 2d century on glass vessels, but were retained for beads.

APPLIED "SERPENT" THREADS made of rods and thick threads became common on glassware in the latter part of the century and were continued profusely in the 3d century.

VANISHING RIBS are found in this century. They were produced from a ribbed cylinder, tube-blown and drawn. The ribs were drawn out and the enlargement of the tube was thinned out towards the ends.

BUCKLED DECORATIONS became common and were gradually adopted for thick glass. The art of making paper-thin glass seems to have degenerated after the middle of this century.

CRENULATIONS were produced by zigzagging the rod or band, or by waving it like the back of a serpent, and by emphasizing the ridges by pinching. At first used on handles and their extensions only, it was later applied to the foot-ring, to the collar and to any other part; finally even the bulge of the body was pinched, producing minute fins and handles. Beakers with crenulated base and Bacchus and Medusa flasks with crenulated handles belong to the 2d and 3d centuries. These were perhaps continued later.

THE HANDLES. Several types were invented and others which were rare in the 1st century now became common. Thus the flat band-like handles with downward-drawn and extended points were frequently made. Crenulations were applied to the handles and their extensions. Handles were attached to the center of the neck instead of to its upper part and the flat thumb rest on their tops, which had previously been horizontal, was now put at an angle. The same variations were used in pottery, a circumstance which permits correct dating. Compare Koenen, XVI, Fig. 16.

THE NECK often widens upwards into a cup and funnel, and a bulge is added to its base. The very wide, funnel-shaped mouth of flasks, bottles and jars came in fashion.

THE BASE was elaborated into a stand or basering, some with crenulations. The narrow foot became wider. A large series of such vessels with foot stand and serpent decorations became characteristic of the latter part of the 2d century and were continued into the 3d.

THE MATRIX became thinner and more transparent than in the older pad-glass, but the thinness of the buckled glass was not improved. Blue and green handles were used on bodies of plain glass. The ivory paste matrix and the ruby-red one were lost. The emerald green degenerated.

THE SECOND CENTURY A.D. TYPES

Continued from the 1st century are the paper-thin vessels with depressed and buckled sides and pad-glass cinerary urns.

MOULDED PAD-GLASS AND BUBBLE-BLOWN GLASS VESSELS

Lotus cups with ribs, plain and banded.

Open truncate, spherical bowls, without foot or base, decorated with moulded rings, bosses, geometric fields.

Open bowl cups with contracted shoulder and widening neck. Medusa and other heads.

Amphorisks with handles, horizontally fluted body and neck. Without foot and base ring.

Flasks representing natural objects, such as fruits, animals, helmets, hammers, baskets, shells, etc.

Bacchus and faun heads. Caput flasks with narrow necks.

Flasks representing tutelary deities, Tyche, and animals. Monkey playing syrinx. All with cylinder necks.

Grape bunches.

Bacchus flasks with wide neck. Caput flasks in general with wide necks.

Date fruit flasks.

Fishes, vase-form with cylinder neck.

Moulded amphorisks with horizontal flutings.

Moulded medallions of glass.

Finger rings.

Vessels with hard matrix, moulded flutings, and glossy surface.

Ampulla sprinklers with inner diaphragm.

Ampulla vessels without diaphragm but with sprinkler form.

Jars with rib flutings.

Spherical jars with rounded base.

Bubble-blown without a mould.

Jars, pitchers, purse shapes.

Patella cups with bracelet rim and high body, continued from 1st century.

Cantharus forms without handles.

Cylindrical beakers and goblets.

Vessels with carved and applied lotus buds.

Cantharus goblets with handles.

Amphorisks.

Prochus flasks.

Pitcher flasks.

Flasks with handle ending on the center of the neck.

Mercury bottles.

Cylinder flasks, stamnia, lagonaria jugs.

Frontinus stamnia.

Ampulla flasks of plain glass. Vials.

MOULDED VESSELS, CUPS AND DISHES

LOTUS BOWLS. RIBBED AND FLUTED BOWLS. According to Kisa the 2d century bowls of this type, so common in the 1st century, are higher than the latter. Low bowls, however, were also in use. But the lotus bowls of the 2d century are coarser, thick and with heavier walls and nearly always of colored reddish glass. All the delicate specimens made of mosaic glass and thin matrix can be considered of the 1st century. They come mostly from Syria.—Text Fig. 97; Pl. 41.

CUPS WITH FLUTED COLLAR BELOW THE RIM. BUBBLE-BLOWN AND MOULDED. Truncate spherical cups with a horizontal band of moulded flutings immediately below the lip rim and reticulated designs of shields and bosses, disks with concentric rings and four-sided fields with circular pits enter in the decorations. Syria.—Pl. 72.

The date is not definitely settled, but they can not be earlier than 2d and not later than 3d century. Cups with ground-out, concaved decorations instead of moulded reliefs are known.

MOULDED OVOID CUP WITHOUT BASE AND HANDLES

Height, 3.7"; diameter, 3.3". Mrs. W. H. Moore Collection. Syria.—Pl. 72, *a*.

Material: pale yellow glass with scaly, magnificently iridescent surface. The form is truncate ovoid with slightly flattened base. Decorations moulded, consist of a broad band around the rim containing upright parallel flutings one inch in height. The main decoration contains squarish and deltoid fields of different size bordered by two larger and two smaller overlapping raised curved lines, in the way of garlands. They are crossed by the mould seam. In each of these fields, nine in all, are circular rings and a central raised boss knob.

This vase is related to the one in the Gorga Collection in Rome, but in the latter the decorations are ground out and sunk, and the fields are of even size like halved hexagons.

TRUNCATE OVOID CUP WITH HONEYCOMB DECORATIONS. Height and width 4.5". Blown in a single mould. Mrs. W. H. Moore Collection.—Pl. 72, *b*.

The six-sided fenestration is unusually deep, and technically speaking this is the most perfect of the specimens known with six-sided cells graduated from base to rim, the largest being at the base. The rim is decorated with the usual horizontal band made up of moulded, upright parallel flutings. Pale yellowish green transparent glass. Found between Tyre and Sidon in Syria.

• PRIESTESS JAR—MOULDED AMPULLA JAR

SPHERICAL BOWL WITH FUNNEL OPENING AND FOUR RITUAL HEADS. Size, 4.9" by 3.7". Mrs. W. H. Moore Collection. Syria.—Pl. 73.

Ritual or libation jar, with four moulded heads, in ritual headdress, apparently

held down by means of a collar around the neck. The headdress is bounded by an oval frame or medallion resting on flutings arranged as branches of the tree of life, made of violet brownish glass, with small turned-over lip-rim. Date uncertain, but probably early 2d century. Related to the funnel-shaped sprinklers and to various jars of the same form but without decorations. One of the finest antique glasses known.

TYPES OF NATURALISTIC REPRESENTATIONS IN GLASS AND GLASS FLASKS

Female heads, double herm vase.

Bust of Roman emperor. Capitoline Museum, Rome.

Head flasks. Caricatures, Kisa, Figs. 303-305.

Bacchus heads, mostly 2d-3d century A.D.

Cherub heads with long hair, 1st-3d century A.D.

Faun and satyrs, 2d century.

Heads of Pan amulets, especially 5th century B.C., in the round.

Sheep, elephant, hippopotamus heads, 5th century B.C.

Doves, ducks, geese. From XVIIIth dynasty to 4th century A.D.

Fishes. Pagan, 1st century A.D. Christian, 4th century A.D.

Fishes in the round, amulets, 4th century A.D.

Phallic symbols, fashionable in time of Commodus and Pertinax.

Sea animals, mussels, worms, octopi, snails, etc. Mussels as flasks as well as in the round. 2d and 3d centuries A.D. Kisa, Fig. 313, p. 768. See also Vopiscus: *Tacitus* (who made such objects).

Almonds, raisins. Augustan era and 2d century A.D.

Figs. From 5th century B.C. to 1st century A.D., all in the round.

Small grape clusters, 1st century A.D. to 3d century A.D. Entire grape flasks mostly in 3d to 4th centuries A.D. Compare Kisa, Figs. 309-312.

Helmet flasks, Kisa, Pl. VII, 2d century A.D.

Hammers, Kisa, Fig. 77, 3d century A.D.

Baskets, 4th century A.D.

Boats and amorines, 1st century A.D., from Pompeii, Slade Collection, Nesbitt, p. 26.

Lotus flowers, apples, plums, pomegranates, cherries, pine cones, strawberries, citrons, olives. (Oranges were unknown to the Romans.)

Sacred vessels in the round. 4th century. The Biblical and Joseph of Arimathea vessels, 4th century A.D.

Dolphins or Jonah monsters, 4th century A.D.

Fishes, Ichthys-Christ, in the round, 4th century A.D.

Protective deities. 2d century A.D. Flasks with cylinder necks.

Monkey playing the syrinx pipes. 2d century A.D. Flasks with cylinder neck.

Wild boar, flasks or in the round. 2d century A.D.

Saddle flasks with handles. 4th century A.D. Sassanian.



Plate 81. Moulded flasks, Syrian. Date doubtful, 1st to 3d century A.D. With two wide and four narrower sides. Mrs. W. H. Moore and Metropolitan Museum Collections, *a*, *b*; Bachstitz Collection, *c*.—See page 331; *Text Fig.* 146.



Plate 82. Tyche ritual flask. Represents the goddess Tyche, protectress of Antioch in Syria. About 3d century A.D. Mrs. W. H. Moore Collection.—*See page 333.*



Plate 83. Syrian glasses with hard, glossy and with difficultly oxidizing matrix. About 2d century A.D. Fahim Kouchakji Collection.—*See page 333.*



Plate 84. Syrian glasses with hard and with difficultly oxidizing matrix. Fahim Kouchakji Collection. About 2d century A.D.—*See page 333.*

CAPUT OR HEAD FLASKS WITH NECK

Moulded flasks with the body in the form of one or two so-called Janus heads, or rather faces, back to back, facing in opposite directions. The form of the neck and mouth of the flasks varies: some possess a straight and short neck, others a low neck and others again a funnel-shaped neck. All blown in a mould of two parts. They are with or without handles, some having the handle bent at an acute angle. They are mostly without special foot, but when one is present it was apparently added to the moulded part after the flask was cast. The appended text figures give some conception of the relationship of the forms and the size and proportions of the neck. The dating of the types is somewhat uncertain, having been in the main made to conform with the dates of the coins found together with the glass. The numerals with the figures are therefore tentative. One or two may belong to the 1st century, but most are of the 2d. Text Fig. 145; Pls. 74, 76.

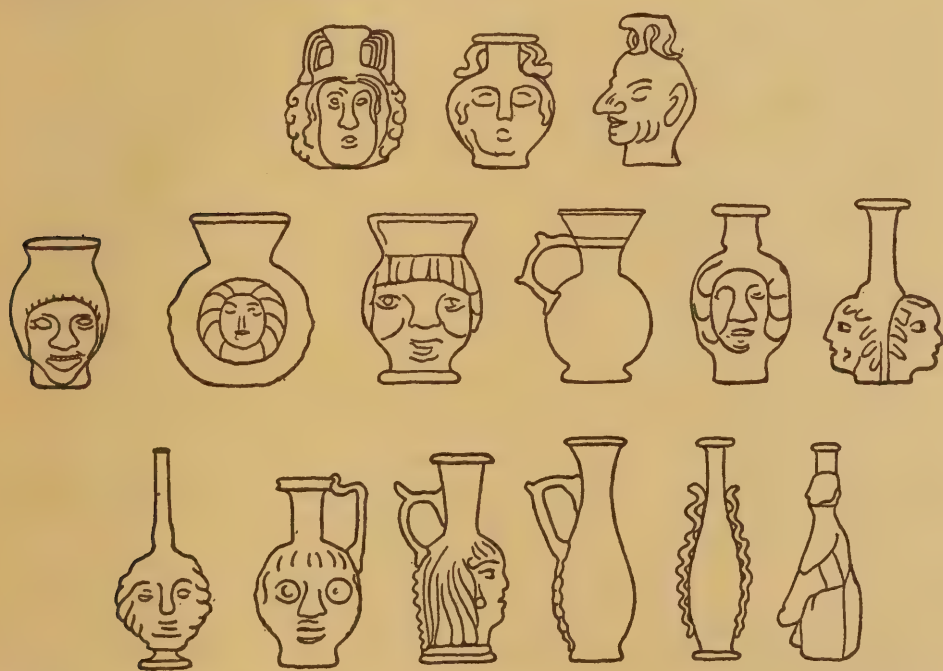


Fig. 145. Caput or head glasses, 1st to 3d century.—1st century A.D., *a* to *d*—all the rest 2d to 3d century—Central Europe, *a* to *d*—the rest Syrian.

BACCHUS FLASK WITH HANDLE

Height, 3.5"; diameter, 1.95". Mrs. W. H. Moore Collection, 693. 2d century A.D. Blown in a mould with added angular handle with two thumb guards. Deep violet, almost blackish glass; spherical body but with an elliptic base, 1.37" by 1.67". In making the flask the mould was placed directly on a base pad and then the bubble

blown in. The hair is designed as three rows of circular bosses, four on each side of the face and five on the forehead.—Pl. 74, *b*.

A bronze vase consisting of a Bacchic head like some of the earlier glass heads is now in the Morgan Collection and dated to the 1st century A.D. by Stephen Poggelayen-Newall. (*Ein Kopfgefäßs. Studien zur Kunst des Ostens. Gewidmet Joseph Strzygowski zum sechzigsten Geburtstage von seine Freunde und Schülern*. Pl. XXI. Vienna, 1923.)

CHERUB-HEAD FLASK WITHOUT HANDLE

Height, 3.2"; diameter, 1.93". 2d century A.D. Mrs. W. H. Moore Collection, 753.—Pl. 74, *a*. The body represents a head with two cherub faces back to back. The workmanship is excellent, design and general appearance cheerful. Hair drooping in ringlets in four tiers or strands down to the shoulders. In this it differs from the Bacchus heads, which generally have curly hair represented by bosses. The matrix is fine opalescent glass without color and quite translucent. The mould ends at or near the base of the neck, the funnel-shaped part having been added by the glass blower. *FAUNS AND SATYR HEADS*. The heads illustrated are of great interest because the design is based on the dynamic symmetry. This characteristic they share with several other caput flasks of related types. This would either suggest a 1st century date, or a survival of the symmetry in sacred, or libation, vessels, far into the 2d century. The Havemeyer satyr head is, however, based on a square, but the vase, Pl. 74, is based accurately on the whirling-square rectangle, with full interior correspondence between measure and design. Both vases are from Syria.—Pl. 75. *LIBATION FLASK WITH MOON GODDESS HEAD*. The circular form of the head suggests the moon face designed diagrammatically. The moulded part including the tall neck is based on a root-3 rectangle with some inner correspondence between design and diagram. The form of the flask with its added diminutive foot is common in the 3d century, but might have existed in the 2d century. It is exactly the same as we find in some flasks decorated with serpent threads, the earliest of which are from the first half of the 2d century A.D.—Pl. 77.

FLASK FORMED AS A DATE

Height, 3.86"; width, 1.15"; mouth, 0.5". Mrs. W. H. Moore Collection, 722. 1st century A.D.

Made of yellowish brown glass, in a mould of two parts; very thin walls, naturalistically corrugated so as to represent the large Egyptian dates found for a brief while during the month of March in the fruit markets of Cairo. In some of these flasks the mouth is short and funnel-shaped, in others it is longer and cylindrical.—Pl. 78, center.

GRAPE FLASKS WITH HANDLES AND NARROW NECK. Moulded flasks without foot-ring or base. The whole body represents a cluster of grapes. Neck narrow, slender, tall, lip and mouth funnel-shaped. One or two handles. According

to Koenen, Fig. XIV, 21, similar types made of pottery were found in Antonine tombs in Germany. Glass flasks of this type are dated by Kisa to the middle of 2d century. This glass is often most delicate and beautiful. 2d century A.D.—Pl. 78. *ROUNDED GRAPE FLASKS WITH LARGE NECK COLLAR*. These flasks are supposed by Kisa to belong to the 3d century A.D. and are thus later than those with naturalistic form. They are also larger, coarser and more regular. They are especially conspicuous on account of the large neck collar between the shoulder and the base of the neck. Made of uncolored, violet-brown, or deep blue glass. Some have been found in Germany, but most come from Syria, which suggests that all were made in Syria, some being exported to Germany or Gaul.—Pl. 79.

GRAPE FLASK WITH COLLAR FLANGE

Height, 5.23"; diameter, 3". Mrs. W. H. Moore Collection, 717. Syria.

The entire body represents a cluster of grapes, bubble-blown, moulded in violet translucent glass. The main characteristic is the wide but thin collar flange surrounding the base of the neck just above the shoulder of the body. The grapes in all similar flasks are arranged in diagonal rows, about eleven berries in a row. The shoulder flange seems to have been included in the mould. Kisa dates similar flasks to the 3d-4th century, which seems somewhat too late. They must be contemporary with other flasks bearing the same conspicuous collar flange.—Pl. 79. A bottle exactly similar, comes from Syria; others have been found in German tombs near Cologne (Kisa, p. 774, Fig. 311, dated to 3d-4th century A.D.).

FISHES AND FISH FLASKS, MOULDED OR HAND-FORMED. The whole flask resembles a fish. The opening when present is on the back in most specimens so far examined. The matrix is often polychrome with violet and brown fins, tail, bands, etc. Date given by Kisa for German tomb specimens, about 2d century.—Pl. 78.

MOULDED HORIZONTALLY FLUTED AMPHORA. Moulded flasks, mostly with pointed base, with or without handles in old-style amphora form, but with the body designed with horizontal ridges and vales, like close flutings. Mostly of deep violet or blue matrix.—Pl. 80.

SIX-SIDED FLASKS WITH MOULDED DESIGNS. Small flasks with two sides narrower than the four others. The decorations on these four sides contain lotus buds or flowers with grooved stems. Those on the two narrow sides contain parallel, horizontal ridges, sometimes depressed along the center. Violet or deep blue glass. Syria. Date doubtful, but they seem related to the moulded glass, Pl. 81, of 2d century.—Text Fig. 146; Pl. 81.

PRESSED AND MOULDED MEDALLIONS OF GLASS. Large and small medallions of glass were common in the 1st and 2d centuries. They seem to be mostly copies from carved metal work. The Castellani horde of small medallions has already been mentioned and also his large Medusa head moulded and carved in opaque blue glass superimposed on a pad of cheaper quality. Most of the small

medallions were used applied on bracelets and on the body of vases, especially under the handles. Rings of glass with moulded inset of glass of a different color were also in use.—Pls. 23, 25.

FINGER RING WITH MEDALLION

Oval, 1.4" by 1.1". The whole ring from front to back is 1.2". Mrs. W. H. Moore Collection. 2d century A.D.—Text Fig. 79.

Material: greenish, uncolored glass covered with a thin, smooth, yellow ochre-colored patina, but not thick enough to conceal any details.

The form of the ring proper is similar to one of gold, also from Egypt, with the cartouche of Marcus Aurelius. The portrait medallion is in high relief, made from a mould, the latter probably taken from a cameo. The work is excellent, representing a Roman lady as a priestess with long curled tresses of hair, crowned by grape bunches and two broad leaves. The neck with a necklace consisting of two rows of spherical graded beads, the largest centered. The face is handsome with very small mouth.—Pl. 25, *e*.



Fig. 146. Six-sided flasks with two narrow and four wide sides. Date uncertain, 1st to 3d century A.D. Syrian.

SEATED FIGURES, HUMAN PERSONAGES AND MONKEYS. These flasks resemble each other so closely that they cause us to believe that they were made at the same place and perhaps by the same artisan. But two types are known.

Seated female deity, probably Tyche. A female figure seated on a square seat or throne. The arms are crossed over the breast under a cloak. On the left side of the throne is seen the moulded figure of a small Eros with wings, a torch in the left hand.—Pl. 82.

Seated monkey with syrinx. Kisa, p. 760, Fig. 307, describes and reprints one of five or six specimens from German and Picardy tombs of the 3d century A.D. The type is identical with that of Tyche, a seated figure, holding a seven-tubed syrinx. Kisa connects the type with the Egyptian monkey god, Anubis, Kynokephalos, which, since Hadrian, became the symbol of Hermes and Pan (Kisa, p. 762; Horapollo, I, 14, 15). The European specimens were probably imported from Egypt or Cyrenaica.

THE TYCHE VASE

Height about 5". Mrs. W. H. Moore Collection. Found in Antioch in Syria.

Made of uncolored glass blown in a mould of two parts. It represents the goddess Tyche, protectress of Antioch, being a replica of the colossal statue of this goddess by Eutychides of Sikyon, the pupil of Lysippos, executed about the 3d century B.C. and reproduced in glass in the 3d century A.D. The same figure is represented on various coins of the period and is known from other designs. It is said by R. Smith that probably the Eros on the pedestal was added afterwards as it did not occur on the original monument. The same Eros has, however, been variously reproduced and it might have represented a standing statue placed near the Tyche of Eutychides. A copy in glass from what appears to be the same mould and by the same maker is in the museum in Berlin. See *Amtl. Bericht. aus d. Kgl. Kunstsamm.* (XXXV, p. 114, Fig. 53), 1913-14; De Ridder, *Mon. Piot*, XII, 1905, p. 55, Pl. VI; Friedrich, *Jupiter Dolichenus*, *Progr. des. Kgl. Gymnasiums zu Custring*, 1911-12, p. 19. The Berlin specimen is described as unique, but at least two more are known.

The foot of the deity appears to be resting on a vase or on the head of a child symbolic of the river Orontes. The right hand rests on the chair, the left is held across the chest; both are covered by the cloak.—Pl. 82.

AMPULLA JARS, SPRINKLERS, FLASKS, VIALS

1st-3d Century A.D.

VESSELS OF HARD MATRIX GLASS, GLOSSY SURFACE. A small series of different types evidently made by the same artist, characterized by the peculiar glossy surface untouched by oxidation, iridescence or decay. The color is deep violet-brown and the surface is always faintly fluted or ribbed. The types include cups, sprinklers and small wine flasks. All come from Syrian tombs. Probably 2d century A.D. In all likelihood they were made by one artist. The cup form Pl. 83, occurs also in Pompeii.—Pls. 83, 84.

MOULDED AMPULLA FLASKS AND SPRINKLERS. A large group of bulging vessels. They are mostly blown in a mould and without foot ring; some are bubble-blown but others are of moulded and pressed pad-glass. The body is bulging, the neck low and the mouth wide. When the mouth is flat a concentric ring is generally seen on its upper surface. They were probably used in the bath and contained unguents. Those with an inner diaphragm between neck and body, known as sprinklers, may have contained rose water and other perfumes. We can distinguish the following subtypes or varieties.—Pls. 85-87; Fig. 147.

Ampulla sprinklers with moulded disks and cross-hatched fields.

Ampulla sprinklers with upright flutings.

Ampulla sprinklers with parallel fenestrations or sunk rectangles.

Ampulla sprinklers with diagonal rows of bosses.

Sprinklers decorated with applied fins.

Ampulla sprinklers decorated with parallel ribs.

Ampulla sprinklers with crenulated base ring and crested ribs.

Ampulla sprinklers with serpent designs of applied threads.

Ovoid ampulla sprinklers.

Ampulla sprinklers with moulded rings.—Pls. 85, c, 86.

All the sprinklers seen by the writer came from Syrian tombs, but the type must occur also elsewhere. The size is one adapted to being held in the hand, and the neck and mouth are wide so as to prevent slipping. The dates of the individual types are not defined but without doubt they extend over the 2d and 3d centuries. A cup with decorations containing depressed fields is dated by Kisa to the 3d century A.D. (Kisa, Fig. 168, f, p. 492) but without special reference.

SPRINKLER WITH BRACELET COLLAR AND CRESTED RIBS

Height, 4.3"; diameter with fins, 3.7". Mrs. W. H. Moore Collection, 702.—Pl. 85.

Uncolored, heavy, faintly tinted, yellowish glass. Metallic white to flesh-colored patina with green and yellow iridescence. Pear-shaped body with bulge near the base. A dentated foot-ring and four perpendicular dentated ribs or crests applied to the body. Between each crest a single tooth point. The upper part of the bracelet is ringed. The diaphragm is but 0.1" in diameter, almost a pin hole. Probably from Syria.

OBLONG AMPULLA SPRINKLER

Height, 5"; width, 1.75". Mrs. W. H. Moore Collection, 715. 2d century A.D., probably Syria.

Made of fine cobalt blue glass, heavy double lip rim collar, upper part of neck bulged. The body is decorated with spiral flutings and striations.—Pl. 85.

MOULDED SPRINKLER WITH PARALLEL RIBS. A common type of hard glass matrix with thick walls, mostly made of violet glass and sometimes with a turned-down collar rim. 3d to 4th century A.D. Syria.—Fig. 147; Pl. 87.

AMPULLA BOTTLES WITHOUT DIAPHRAGM. Bottles of the same general form as the sprinklers are quite common in Syrian tombs. They are mostly decorated with ribs and are of the same types of glass, and with the same patina and iridescence as the sprinklers. They seem to be of the same period. All seen by the author came from Syria. These ribs are sometimes fin-like and were apparently produced in a mould.—Text Fig. 147, IV.

JARS WITH RIBS AND FLUTINGS, 2d TO 3d CENTURY A. D. Of the same general technic and matrix as the sprinklers of this period, especially those with vanishing ribs. Metropolitan Museum, one with waved and pinched prolongation of the handle extending over the lip rim. Syria.—Pl. 88; Text Fig. 147, V.

SPHERICAL JARS WITH ROUNDED BASE. Several types, some with full mouth and wide neck, others with narrow, low neck and comparatively narrow mouth. Some without handles, others with dolphin handles between rim and shoul-

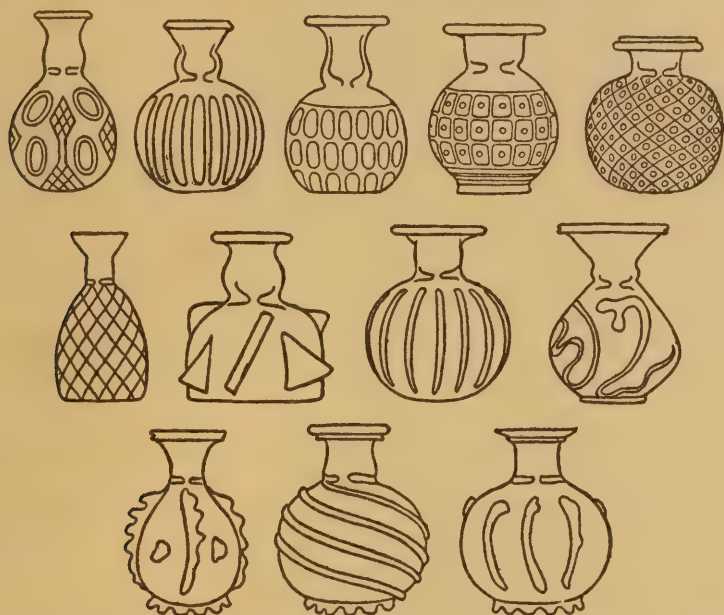


Fig. 147. I-III, Ampulla sprinklers, 2d to 3d century. The inner diaphragm is indicated though not generally seen from the outside. Moulded or applied decorations, mostly from Syria.

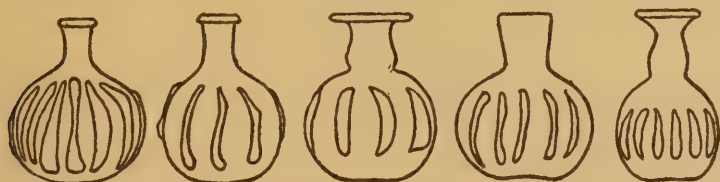


Fig. 147. IV, Low Ampulla bottles without diaphragm. Syrian 2d to 3d century A.D.



Fig. 147. V, Ampulla jars, 2d to 3d century A.D. All except the first from Syria.

der. Some decorated with circular bosses, others with concaved lines in spiral diagonal direction around the body, others again are plain. All possess double collar rim. Those the writer has examined came from Syria. Date uncertain, but probably

2d to 3d century A.D. Kisa reproduces them (Figs. 60, 61, 62) but does not date them with certainty. Those with single rim are possibly of the 1st century A.D.
WIDE JARS WITH HANDLES. Heart-shaped body, contracted low neck and full, wide mouth opening with rim. Two minor loop handles. Syria. Violet matrix.

BLOWN PITCHER JAR

Height, 2.63". Diameters: mouth, 2.1"; body bulge, 2.3"; base, 1.7". Material thin, transparent, uncolored and untinted glass. Mrs. W. H. Moore Collection, 720.

The form is that of a pear-shaped jar, with wide mouth contracted but low neck, and a low foot ring. One handle, between lip rim and shoulder, with an upper, upright and a lower horizontal thumb and finger rest. Rim flat with inner ring. Blueish steel lustered patina with metallic iridescence.—Pl. 94.

DEEP BUT NARROW BOWL JARS WITH RIBS. The forms resemble bags or purses. Low and narrow ribs produced by moulding.

BOWL VASE WITH WIDE MOUTH AND ADDED THREAD RIBS

Height, 3.54". Diameters: opening, 2.2"; girdle region, 3"; base, 1.5". Mrs. W. H. Moore Collection, 661.—Pl. 88, *a*.

Material pure uncolored glass, with very thin walls.

Form is that of a truncate ovoid cup with slightly flaring mouth rim. Almost truncate pear-shaped.

The decoration consists of nine added perpendicular thread ribs compressed and drawn upwards by pincers all along their outlines. Or the bubble was blown in a mould and the ribs, being too low, were pinched and drawn out afterwards. This vase has much in common with the ivory paste bowl cup with dragged technic described and figured elsewhere in this book. The matrix is the most delicate possible, 2d century A.D.

THE PATELLA CUPS OF THE 2d CENTURY A.D. These cups differ from those of the 1st century by possessing a double, overfolded, downward-projecting lip collar, which undoubtedly has the advantage of preventing the cup brim from slipping in the hands of the one making the sacrifice. They are never made of ivory paste glass, but generally of violet, uncolored or of blue glass. Apparently blown and not moulded, and not finished by grinding, so far as known. Their form is less delicate, rarely based on the dynamic symmetry, but sometimes on the static or square diagram. But one single cup of those measured was based on the root-2 rectangle, with the lower end of the rim passing through the two upper eyes, and with the base determined by the perpendiculars passing down the two centers, right and left. In this specimen the collar is especially large and carefully formed. All cups the writer has examined came from Syria. The form existed in pottery of the 2d century but with a slight variation in the slope of the lip, which is upwards.—Fig. 148.



PLATE IV. MOSAIC GLASS PATELLA AND LOTUS CUPS. AUGUSTAN ERA. MRS. W.
H. MOORE COLLECTION. SEE PAGE 198.



Plate 85. Sprinklers with inner diaphragm. Mrs. W. H. Moore Collection, Syrian, *a, b*;
University of Pennsylvania Museum, *c*.—See page 334.



Plate 86. Blown and moulded sprinkler, Syrian. Fahim Kouchakji Collection. About 2d century A.D.—*See page 334.*



Plate 87. Syrian sprinklers with inner diaphragm, 2d to 3d century A.D. Fahim Kouchakji Collection.—*See page 334.*



Plate 88. Jars with moulded or applied ribs. About 2d century A.D. Mrs. W. H. Moore Collection, *a*; Metropolitan Museum, *b-e*.—See pages 334–336.



Plate 89. Ampulla flasks, 1st century A.D. to end of 2nd century A.D. Mrs. W. H. Moore Collection. Syria. Carinated type, *a*; also found in the Naples Museum, from Pompeii.—See pages 292, 371; *Text Fig.* 129, 1.



Plate 90. Ampulla flasks, 1st and 2d centuries A.D. Mrs. W. H. Moore Collection.—*See* pages 292, 370.



Plate 91. Patella sacrificial cups, 1st and 2d centuries A.D. Mrs. W. H. Moore and the Metropolitan Museum Collections, *a*, *b*; amphorisk with bracelet lip made of bluish ivory paste glass, probably 1st century A.D. Syrian.—*See pages 36, 355.*



Plate 92. Cantharus cups. Dates uncertain, probably 2d to 3d century. Mrs. W. H. Moore Collection.—*See page 355.*

PATELLA CUP WITH BRACELET RIM

Height, 1.7". Diameters: base, 2.4"; lip rim, 2.9". Mrs. W. H. Moore Collection. Syria.—Pl. 91.

Fine violet-brown glass, bubble-blown. The wide double collar overlaps the lip rim as in most of the 2d century cups of this type. The bracelet rim is exteriorly concave in the center, with the lower third projecting over the body proper. This is the main distinction between the 2d and the 1st century patella cups. The 2d century cups are never based on the dynamic symmetry so far as now known.

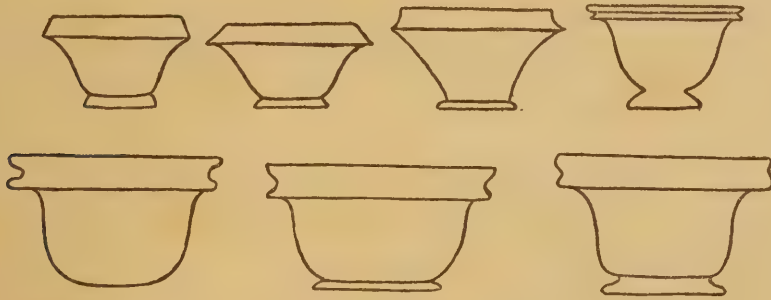


Fig. 148. Patella sacrificial cups, 2d century A.D.—Pottery after Koenen, XIII, p. 88—and Oswald and Pryce, LXXII, *a* to *d*—glass, Syrian. All furnished with heavy collar rim, *e*, *f*.

SACRIFICIAL CUPS WITH A SPOUT. Small cup about 3" wide, with a small lip spout and a dreg rim to catch the sediment. Base often deeply raised from below.

WIDE BOWLS WITH LOW FOOT-RING AND COVER. This type consists of a low wide body, the rim of which is decorated at opposite ends with petaled or fluted finger guards. Some are furnished with a cover. The one figured is in the Gorga Collection in Rome, Italy. The type is intimately related to the plate-bowls made of pottery, figured by Koenen, XVI, Fig. 27, and by Oswald and Pryce, Pl. LVII, who date these potteries to the 2d century. They probably came into being toward the end of the 1st century. The form varied from a bowl to a tray and the decorations from horizontal to slightly raised.—Fig. 143, *a*.

CANTHARUS FORMS WITHOUT HANDLES. Flat and low cups with outward-flaring rim are not common in antique glass. Kisa does not describe any, but reproduces two in his Table G, Nos. 422, 426, but without references. Those in the Moore Collection are of elegant form and of good glass. They are strongly covered with peeling iridescent patina similar to cups of the 2d century in general; hence they are temporarily grouped here. The one with the nodus or knob is probably the latest, possibly of the 3d century A.D. It has the form of a stemless cup with large base ring, to which a stem and foot were added. All may, however, have been made at the same time. Probably Syrian.—Pl. 92.

CUP WITH STAND—BUBBLE-BLOWN OF A THIN GREENISH GLASS

Height, 2.8"; diameter of top, 4.53". Mrs. W. H. Moore Collection.—Pl. 92, *a*.

The form is that of an elegantly designed sacrificial cup furnished with a foot and short stand.

Material: very thin glass, with patina and iridescence in the central parts. Blue-green glass for the foot, yellowish for the cup.

Technic: the cup proper seems to have been bubble-blown in a mould, and finished on a turntable, which technic resulted in a thick edge to the rim, with several concentric rings near the edge. There is also a wound spiral curved line around the body from rim to base.

The foot disk is circular, with funnel-shaped cavity from below, the stem is very low and is made of a hollow tube pushed into the base of the bowl. Even the foot disk seems to have been moulded. One of the most delicately formed specimens of this type known. Probably Syrian.

BUBBLE-BLOWN CUP WITH FOOT-STAND AND REVERSED CENTRAL COLLAR

Height, 4.25". Diameter of top, 5.72"; of cup below rim and at interior opening, 4.4"; of cup at girdle, 4.2"; of cup at base, about 2.2"; of reversed shoulder guard of stand, about 2.8"; of nodus of the stem, 0.7"; of foot-ring, 2.7". 2d century A.D.—Pl. 92, *b*. Mrs. W. H. Moore Collection. Probably Syrian. Material, thin translucent greenish tinted uncolored bubble-blown glass.

Technic: probably blown in a mould and finished by turning, judging from the several concentric rings around the lip flare.

Form: the form is that of the calix with wide lip turned outwards, and with rounded bowl base.

The stand is remarkable, with a narrow foot disk with a very low and narrow stem, consisting of two nodi or knobs one above the other. At the lower part of the bowl projects downwards a shoulder or bracelet guard which partly conceals the upper of the two knobs.

CYLINDRICAL BEAKERS AND GOBLETS, FIRST CENTURY A.D. TO THE ARABS

Numerous beakers and goblets are in our museums, but nearly always without date or even locality. Many are, however, from Syria. They comprise the following main types, which merge into each other.—Text Fig. 149, I-V.

CYLINDRICAL GOBLETS WITHOUT BASE RING AND FOOT-RING. 1st century A.D. Common in Pompeii and Tripoli, Africa.

BEAKERS WITH SLIGHTLY BULGING SIDES AND MOULDED FIGURES. Mostly from Pompeii and Syria, 1st century A.D. Already described.—Fig. 130; Pl. 63.



Fig. 149. Beaker types from 1st century A.D. to Arabs.—I, Egyptian and Sidonian, *a*—Pompeii, *b*; II, 2d century A.D., see Kisa, note, p. 13, and Table B, 81—Syrian, *c*; III, Common type with ground decorations, 3d century A.D.; IV, Beakers with engraved lines, 3d to 4th century A.D., Europe and Syria; V, Beakers, 4th and 5th century A.D., Merovingian, Gaul, Rhine, Syria.

BEAKERS WITH CARCHESIUM OUTLINES BUT WITH SIMPLE FOOT RING. The body contracts from the rim-lip towards the base, but just above the foot it bulges out like the body of a carchesium. Pottery vessels of this form, or approaching this form are dated by Koenen to Tiberius (Pl. XI, Fig. 2), which suggests that they may all belong to the 1st century. In that case the Moore beaker, No. 697, belongs there, I *e*. (Text Fig. 149.) Also called "carinated."—Pl. 93.

BEAKERS WITH BUCKLED SIDES. 1st to 2d century A.D. Common in Pompeii.—Text Fig. 149, I *c*.—Pl. 69.

SLIGHTLY TAPERING BEAKERS AND GOBLET'S WITH LOW FOOT-RING. With engraved horizontal line bands. Probably 2d–4th century A.D., Kisa, Table E, 282–286.

VERY NARROW CYLINDRICAL BEAKERS WITH GROUND SURFACE. Probably 1st to 2d century A.D.—Fig. 149, II *a*, III *a*, *b*.

CYLINDRICAL BEAKERS WITH HORIZONTAL THREADS, AND SOMETIMES WITH RINGS SUSPENDED FROM EYELETS. 3d to 4th century A.D. Fig. 149, IV *f*.

BEAKERS WITH GROUND-OUT DECORATIONS, HEXAGONALS OR CIRCULAR DEPRESSIONS. These seem with certainty to come from 3d century tombs, both in Syria and Europe. In Scandinavia they are found also in later tombs.—Fig. 149, III *a*, *b*.

BEAKERS WITH APPLIED DECORATIONS OF PETALS, TRIANGLES, BOSSES, SHIELDS, ETC. 1st to 4th century A.D. Fig. 149, II, V.

BEAKERS WITH CRENULATED BASE RING. 2d to 3d century A.D.—Text Fig. 149, II *e*.—See Figs. 150, 165, *b*.



Fig. 150. Beakers with crenulated base ring. Principally 2d century (compare Kisa, note p. 13, Table B, 81).

TUMBLERS, BEAKERS AND GOBLET'S WITH ROUNDED BASE, SO THAT THEY CAN NOT STAND UPRIGHT WITHOUT A HOLDER. Mostly 4th century A.D.—Fig. 149, IV *g*.

BEAKERS WITH BULGING BASE. 4th to 5th century A.D., Fig. 149, V *b*, *c*.

BEAKERS WITH POINTED BASE, LIKE FUNNELS. 4th to 5th century A.D.—Fig. 149, V *e*.

BEAKERS WITH STRONGLY FLARING RIM. Downward-tapering body. Mostly decorated with gold and enamel. Arabic, from 12th century A.D. to later.

BEAKERS WITH TAPERING BODY, FLARING NEAR THE RIM BUT WITH THE RIM REGION CONTRACTED. Decorated with gold designs and enamel. Arabic.—Fig. 276.

CYLINDRICAL BEAKERS WITH CONTRACTED MOUTH RIM. A variation of the two last mentioned types. Arabic.—Fig. 276.

DATES OF THE ANTIQUE BEAKERS AND GOBLETS. But few of the beaker forms enumerated are dated with absolute certainty. Those, however, found in Pompeii form the exception as they seem in the main to belong to the 1st century A.D. Still we must guard against the belief that everything found in Pompeii was made previous to the destruction of the city. Many objects claimed to have been found in the ruins in reality come from later tombs made on or near that site. On account of the uncertainty of the dates of the antique beakers, or drinking glasses, we have preferred to consider them all together, reserving the privilege of mentioning some of the later and better forms separately.

PLAIN BLOWN CYLINDERS WITH PLAIN RIM

Base without foot-ring or stand, flat, rounded margin, thin, blown, walls with a sharp, slightly outward-flaring lip rim. The most common and simplest type in Pompeii, and in the 1st century chamber-tombs of Tripoli. Tripolitania, Africa.—Text Fig. 125; Pl. 65, II.

CARCHESIUM BEAKER OF BUBBLE-BLOWN GLASS

Height, 3.33". Diameters: top, 3.25"; shoulder, 2.4"; base of body, 1.27"; base ring, 1.55". Mrs. W. H. Moore Collection, 697. Syria.—Pl. 93.

Material, translucent, slightly greenish yellow glass.

A carchesium goblet, consisting of an upward widening body set on a conspicuous shoulder-ring near the base. The body continues to the very base ring, tapering, with a central rise from the shoulder to the base. The base ring is very small, narrow and low in the 1st century style.

The upper edge is slightly turned inwards, but finished off by grinding. The base is beautifully concaved, as if placed on a mould after finishing, but shows no sign of grinding.

BUBBLE-BLOWN CYLINDRICAL TAPERING BEAKER WITHOUT FOOT-RING OR BASE

Height, 4.2". Diameters: top, 1.9"; base, 1.4". Mrs. W. H. Moore Collection, 708.—Pl. 93.

Material: uncolored, slightly tinted yellowish green glass, quite translucent. About 0.1" in thickness.

Technic: Apparently blown glass but finished by grinding. The two slightly concave bands around the exterior produced by turning and grinding. The lower is a little below the center.

BEAKERS WITH CRENULATED FOOT-RING. This includes a large series, some moulded with arches, others formed free or moulded with applied decorations. The latter consists of circular bosses or knobs, spiral or ear-shaped bosses, pine scales. Similar beakers were made by German glass blowers during the Renaissance, according to Schmidt, Catalogue Berlin Museum, but whether or not the one he figures is modern as he claims is uncertain. A vessel with crenulated base is in the Pompeian collection of the Naples Museum. Those illustrated in the text are certainly antique, even if the date is vague.—Fig. 149, II, *b-c*.

DATE OF TYPES WITH CRENULATED FOOT-RING. It has already been mentioned that the crenulated foot-ring occurs on many types of vessels of the 2d century A.D. but that the early and late limits of this group are not well defined. Whether this base developed from the crenulated ribs or crenulated downward prolongations of the handles is not known; still the connection is evident. It continued into the 3d century.—Fig. 150.

VESSELS WITH FORMED APPLIED LOTUS BUDS. The same decorations found in moulded ware were also made separately, by moulding, by carving and stamping and applied separately to the body of the vessel. Some have been found in Pompeii, others in Gaul, the Rhine valley and elsewhere. Kisa, Fig. 139, p. 636; 138, p. 639; 272, p. 638.—Text Fig. 132.

Among the applied units we find especially lotus buds and rosettes, but also triangular decorations intended perhaps to represent petals. Compare Kisa, Fig. 40, p. 639; Fig. 142, p. 639, respectively from Bonn, Pompeii and Rouen.

CANTHARUS GOBLETS WITH OR WITHOUT HANDLES. Stem goblets are



Fig. 151. Cantharus and carchesium types, 1st to 4th century A.D.—The Hermitage vase, silver over glass, 1st A.D., *a*—green glass, Cologne, 2d A.D., *b*—the Torrita vase carved on a cameo, *c*—represented canthari, catacombs of Prætextatus, first half of 3d century A.D.—same place, but first half of 4th century A.D., *f*—blue glass chalice from Amiens, British Museum, 4th century A.D., or earlier, *g*.

rare in the 2d century, but a few have been found. The best known is that illustrated by Kisa, made of green glass and decorated with serpent threads. Except for the absence of handles it resembles the cantharus represented in cameo on the Torrita cantharus. (Described by Lovatelli. Also by Kisa, but incorrectly copied, Fig. 192, 4.) For comparison we include three representations from Roman catacomb drawings.—Text Fig. 151.

BUBBLE-BLOWN AMPHORA WITHOUT BASE RING

Height, 7.1"; diameter at shoulder, 2.8". Mrs. W. H. Moore Collection, 685. Syria.—Pl. 94.

Matrix translucent blue-green tinted glass, with the handles of a slightly darker shade of green.

The form is that of a typical Greek amphora with tapering body and with tall neck. Intended always to rest in a tripod stand. The handles are made of a streaked, flattened rod, about 0.25" wide, somewhat sigmoid, connecting the shoulder of the body with the center of the neck. The upper part of the handle is a flat shield, the lower end is turned upwards and inwards.

The matrix is covered with ivory colored patina over the handles and in some other places.—Text Fig. 152.

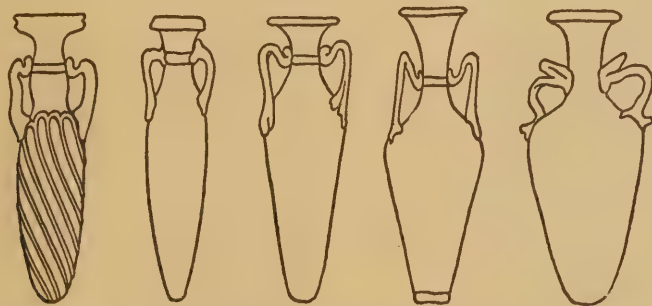


Fig. 152. Amphorisks of 2d century A.D.—Brooklyn Museum, *a*—Gorga Collection, *b*, *c*—University Museum, Philadelphia Museum, Journal, 1918, 4, *d*—Mrs. W. H. Moore Collection, *e*.

PROCHUS FLASKS. PEAR-SHAPED FLASKS WITH LOW NARROW BASE RING. These peculiar flasks appear in the end of 1st to 2d century, according to Kisa, p. 386. They are certainly related to the Sidonian Bacchus flasks with pear-shaped base of the same period. The body has the shape of an inverted funnel. The single handle is continued downwards as a serrated tail. The upper end of the handle often ends some distance down the neck.—Text Fig. 153, I.

PITCHER-FLASK WITH PLAIN OR FLUTED BODY. Height about 8.9". Material, beautiful bubble-blown blue glass. Syria. The form of the body is elongated pear-shaped, with a low base ring with sloping sides. The body emerges gradually into the neck, which is short and narrow and in turn gradually emerges into the funnel-shaped mouth. The handle is sometimes characteristic, being bent into a triangular loop, the tail part reaching to the base, exactly as in the Faun vase.

FLASKS—HANDLE ENDS ON THE CENTER OF NECK. A very large class of flasks continue uninterruptedly from early 2d to late 3d century, having various types of neck. It is not possible to determine the exact chronology, and no records exist of other objects found in the tombs. They seem to be promiscuously dated by Kisa to 2d and 3d centuries.

The type seems to exist both in Syria and Germany. It is intimately connected with other types. For instance, some can be referred to the class decorated with horizontal serpent threads, others to those with upright serpent threads. Others of the same form possess no handles, but still belong to the same general class.

Some have no base ring or stand, others are flat based, others again possess a low stand with nodus. Amphorisks are also found with similar handle endings in the 2d century A.D. The most certain date of all these glass flasks is derived from pottery flasks of the same type, some being illustrated by Koenen, Pl. XVI, 16, and dated by him from coins of the early Antonines, 2d century A.D.—Text Fig. 153, II.

SLENDER FLASKS WITH SMALL NECK HANDLES. The body elongated pear-shaped, very slender necks, with the slender handle forming a loop on the neck itself. Probably 2d century A. D. Roman collection, probably from Germany. Compare Koenen, XVI, 16.—Fig. 153, III *a, b*.

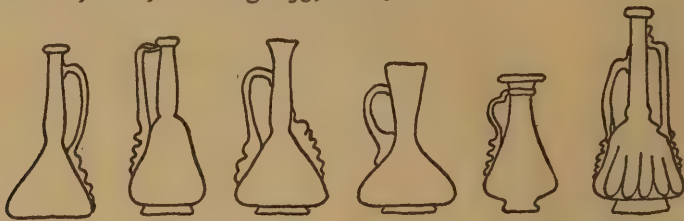


Fig. 153. I, Prochus flasks, early 2d century A.D., German tombs (Kisa, Fig. 252-256, 322).



Fig. 153. II, Prochus flasks and related types, 2d century A.D.—Syria, *a*—Rhine valley, *b*, *c*, *d*, *e*—Gorga collection, *f*. Note the angular handles.

AMPULLA FLASKS WITH TAILED, ZIGZAG HANDLES. Single or double loop handles ending on the middle of neck. The tail of the handle continues downwards. In some the handles end on the lip. 2d to 3d century.—Fig. 153, III.

SLENDER FLASKS WITH A MASK BELOW THE HANDLE. Body is oblong pear-shaped, handle ends on the neck. Mouth is simple or slightly widened. Body striated, a slender handle, below which is sometimes a mask of a lion or human face. Kisa dates the type to the 3d century, but judging from the form this seems too late. The author here temporarily places them in the 2d, which seems more proper. A similar flask without mask disk is placed by Kisa in the 2d century.—Fig. 153, III.

MERCURY BOTTLES. Four sides, narrow, slender neck, base stamped with a figure of Mercury or with Roman letters, birds, genii, Fortuna, horns, horse, ivy leaf, trees or athletes. The single figure is always in low relief, placed on the bottom of



Plate 93. Glass beakers. Carinated 1st century A.D., *a*; cylinders, *b*, *c*, *d*; 3d to 4th century A.D. Mrs. W. H. Moore Collection. *See pages 356, 357, 426.*



Plate 94. Syrian types. Mrs. W. H. Moore Collection. Amphorisk, about 2d century A.D.
The others 1st to 2d century A.D.—*See page 361.*

bottles, which were used for unguents or oils at the bath. Some found with coins of Commodus, but Kisa dates the majority to the 3d century. Mostly from the Rhine valley. (Kisa, p. 782.)—Text Fig. 67.

STAMNIUM FLASKS. Cylinder flasks without special foot-ring or stand, with one or two handles, some rounded, others with flat band handles. Mouth funnel-shaped or flat, generally with rim collar; body mostly plain but also decorated with serpent threads or geometrical engravings in lines and ovals, the engraved ones being of the 3d century A.D., the plain ones mostly of the 2d century A.D. The stamnia extend over a long period, beginning with the 1st century A.D. but most specimens so

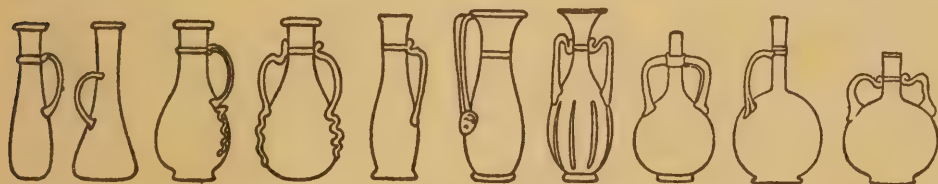


Fig. 153. III, Flasks with handles on a central neck band, 2d to 3d century A.D.—Rome collection, *a, b*—Metropolitan Museum, *c, d*—Cologne, *e*—Syria, *g*—pottery (according to Koenen, XVI, 16, 2d A.D.), *h, i*—3d century A.D., Kisa, Table C, 138, *j*.

far found date from the 2d to 3d century A.D. With the *cœnochoæ* or wine flask, the stamnia are the most common flasks of antiquity and with more detailed study dates can probably be separated. Fig. 154. A very well-dated 1st century stamnum type is represented on the tombstone stela of M. Valerius Celerinus, found in Spain (Kisa, Fig. 14). It is represented together with a cup with horizontal handles, like the Augustus vase, a type which is never found after the 1st century A.D. For comparison we have enlarged these reliefs by which four distinct types may be dated.—Text Figs. 154, 155.



Fig. 154. Represented vessels, Augustan era. Stela of M. Valerius Celerinus, Spain.

FRONTINUS STAMNIA, OR BARREL FLASKS. From the latter part of the 2d century A.D. continuing until the early part of the 4th century A.D. we find in Gallic and Rhine valley tombs a series of stamnum flasks which possess the body form of a barrel with hoops but with the addition of a narrow neck and one or two handles. The under side of the base is stamped *Front*, or *Frontiniana*, which gave Kisa a clue to the theory that they came from a factory owned by the family Frontinus. In the typical and stamped specimens the body is blown in a mould, but some of the less pretentious in the series were plain and simply decorated with threads to

imitate the hoop bands of the barrel (Kisa, p. 787, Figs. 57, 324, 324a). Another series resembles barrel canteens with side handles, such as are yet used in the country districts of Scandinavia and Germany for carrying liquid to the field (Kisa, 58, 59).

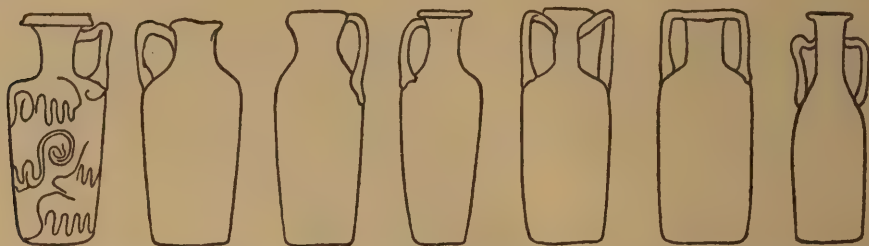


Fig. 155. I, Cylindrical flasks, stamnia.—Cologne, Kisa, Fig. 121, *a*—New York, Brooklyn and private collections, probably Syrian, 2d century A.D., *b* to *g*.

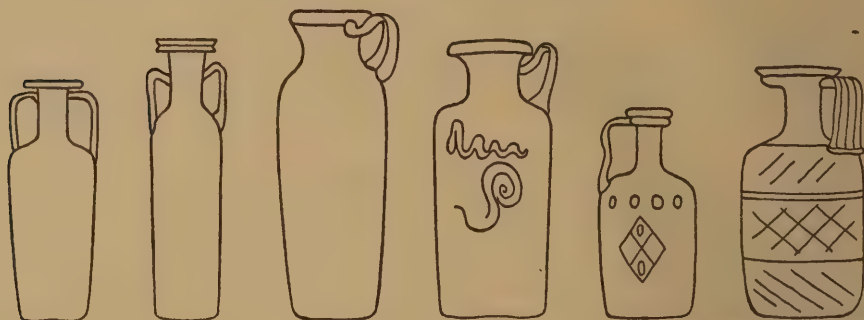


Fig. 155. II, Stamnia, 2d to 3d century A.D. German tombs, except *c*, Gorga Collection, Rome, Italy.

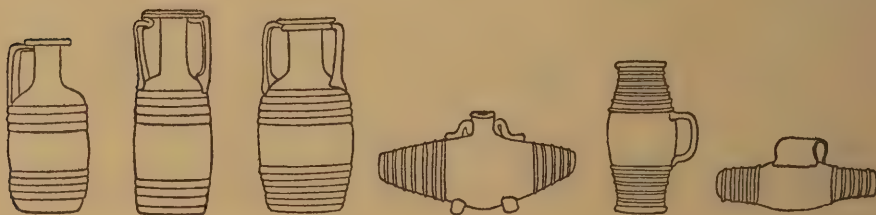


Fig. 155. III, Barrel flasks, Frontinus stamnia.—Kisa, 57a, *a*—Metropolitan Museum, 2d to 4th A.D., *b*—Cologne, Kisa, 57, *c*—canteen flasks, 4th century A.D., *d*, *e*—amulet case, Syria, *f*.

Connected with these two series are the amulet cases, also of glass, resembling small barrels, but of diminutive size and used apparently for necklaces. In these the thread passed to a side eyelet in the manner shown in the figure. These amulets all come from Syrian tombs of the 4th century A.D.—Text Fig. 155, II.

CYLINDER FLASK WITHOUT HANDLE

Height, 3.55"; diameter of body at shoulder, 1.9". Mrs. W. H. Moore Collection.

Translucent uncolored glass of great purity, strongly oxidized and with flaking patina of opaque white. Steel blue iridescence elsewhere.

A downward-tapering cylinder, with nicely rounded shoulder and base. The shoulder is flat, rounded merely at the edge. The neck is quite low and narrow, about 0.8" wide by 0.5" high. The mouth flange is thick and rounded over the edges.

The base is slightly concaved upwards. The whole was bubble-blown and hand-formed.

BLOWN FOUR-SIDED JUG

Height, 4.1". Diameters: top, 1.7; narrow of body, 1.7"; width of body, 2.2". Mrs. W. H. Moore Collection, 713.

Matrix coarse, natural blue-green, translucent glass.

A four-sided column with two sides wider. The neck is low and contracted, superimposed by a flat-in-center ringed lip-rim. There is a short but wide ribbon handle from the under side of the rim to top of shoulder. The decorative part is confined to one concaved shallow oval depression on each side.

CYLINDER FLASK—STAMNIUM FLASK

Height, 6.8"; diameter at bulge, 2.8"; handle, widest part, 1.3". Mrs. W. H. Moore Collection, 684.—Pl. 94.

Very fine translucent uncolored glass without any perceptible tint. Technic, bubble-blown. The flat handle was added. The form is that of typical 2d century Syrian glass of cylinder shape, formed in the bubble. The mouth is funnel-shaped, with flat horizontally creased lip rim. A narrow neck with inward-swung sides, a sloping shoulder and a cylindrical, slightly downward-tapering body. The handle is typical, flat, composed of three parallel strands, or flattened rods, convex on both sides. The form of the handle is a reversed, flattened "C" between shoulder and lip-neck.

THE AMPULLA FLASKS OF PLAIN GLASS. At present the exact date of these spherical and pear-shaped flasks can not be absolutely determined. In general it can be said that in these types the forms are not well established except in the finer types. In seeking the date the glass matrix must first be considered; the lip rim also furnishes a general clue after the end of the 1st century. Still there can be little doubt that with time even these less important flasks and bottles can be precisely dated. For the present, the general period, 1st to 3d century A.D. must suffice.

AMPULLA BOWL FLASK

Height, 11.05"; of bowl part, 3.7". Diameters: neck and funnel, 3.8"; funnel, 1.7"; bowl, 4.1". Mrs. W. H. Moore Collection, 716. 1st century A.D. Matrix uncolored transparent glass covered with scarred and bark-like patina, intensely iridescent. The body is spherical. The cylindrical neck merges gradually with the funnel rim.—Pl. 90.

BOWL FLASK WITH FLATTENED BOWL BODY

Height, 1.53"; diameter of bowl bulge, 1.43". Mrs. W. H. Moore Collection, 725.—Pl. 90, *e*.

Material, thin, uncolored pure glass covered with a golden yellow patina and brilliant iridescence.

The form of the bowl is that of a flattened onion, the neck is without any bulge or swelling, tapering gradually from top to shoulder. The mouth is funnel-shaped of moderate size.

BOWL FLASK OF PLAIN GLASS

Height, 2.3"; diameter of body at bulge, 1.8". Mrs. W. H. Moore Collection, 615.—Pl. 89, *b*.

The material is opaque glass apparently greenish gray, covered by a thick ivory yellow patina.

The form is that of a wide and short pear, with narrow neck and a narrow flat lip flange. The neck is contracted at the shoulder as well as at the top.

AMPULLA BOTTLES WITH TALL NECK AND LIP FLANGE. VIALS. The common flasks or bottles of the second series are endless in variety of form, neck and lip. They are less graceful, of coarser material and with heavier lip rims than the older types.

VIAL WITH PEAR-SHAPED BODY

Height, 3.7"; diameter of body at base, 1.5". Mrs. W. H. Moore Collection, 663. Material is thin, light-weight glass, uncolored, transparent.—Pl. 89.

The form is that of a pear-shaped ampulla with body higher than the neck part. The neck slightly tapering with lower bulge above the usual contraction. The lip ring is small but distinct.

VIAL WITH DISTINCT NECK AND WIDE LIP

Height, 2.4"; diameter of body bulge at base, 1.1". Mrs. W. H. Moore Collection, 675.

The matrix is greenish tinted glass, very heavy at base but with no special base ring.

The form is characterized by a wide flat lip flange, a cylindrical neck with lower bulge and contraction, and by a pear-shaped body, which contains a heavy base-drop or pad. The top of the lip flange is folded in at the edge.

VIAL WITH PEAR-SHAPED BODY AND CYLINDER NECK

Height, 4.35"; diameter of body at center, 2.3". Mrs. W. H. Moore Collection, 667. Matrix heavy, thick, uncolored transparent glass. Blown from a bubble.—Pl. 89.

The form is that of a pear-shaped ampulla with narrow cylinder neck, a narrow, low lip flange, a body in which the diameter of the bulge is situated near but not at the base.

The decoration consists of an impressed narrow band a trifle above the bulge of the body.

FLASK WITH PEAR-SHAPED BODY AND THICK CYLINDER NECK

Height, 4.65"; diameter of body at base, 2". Mrs. W. H. Moore Collection, 706.

The form is that of an ordinary ampulla with cylindrical neck, heavy thick lip flange and a short pear-shaped body without foot ring.

The material is thick, heavy slightly greenish tinted translucent glass, heavy with cream colored patina and iridescence.

The base is slightly concaved.

FLASK WITH CYLINDER NECK AND CARINATED BODY

Height, 8.75". Mrs. W. H. Moore Collection, 686.—Pl. 89. Probably Syrian.

Violet-brown glass with tall cylinder neck ending upwards in rod collar. Similar flasks but seemingly with plain mouth rim have been found in Pompeii and are now in the Naples Museum. The type is very rare but a specimen from Syria of the same general form but with ground-down surface was measured and found to have been based on a root-3 rectangle. It was apparently made of pad-glass and tubes, and could accordingly be dated to the 1st century A.D. It might be that the Moore flask is of the same date. The peculiar cup-shaped base of the body is also characteristic of the carchesium beaker, Pl. 93, from Syria.

WINE FLASKS OR OENOCHOÆ OF THE 2d CENTURY. The wine flasks of the 2d century A.D. vary considerably in type, but the following forms have been recovered in whole series:

Heavy-set forms with plain body, comparatively small, double or single lip rim and one loop handle. The date was already established by Otto Jahn (*Bonn. Jahrb.* 34, 70, 4. 1863, p. 229) to first half of 2d century A.D. Fig. 156, I, *a* (Jahn's figure); *b*, *c*, *d*, from Syria.

Tall, slender forms with narrow base, heavy floreate mouths much wider than the base. Some as high as 15 to 18 inches. Found both in Syria and Germany. Mostly made of uncolored glass, but colored matrix flasks are also known. Yellow with blue-green handles, base, lip-rings and neckband is common in most of these types.—Text Fig. 156, II.

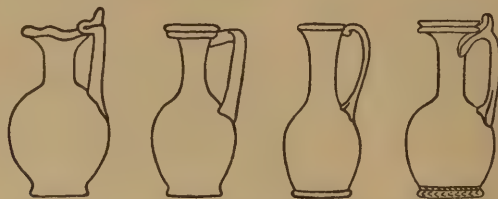


Fig. 156. I, Wine and oil flasks, middle of 2d century.—After Otto Jahn, *Bonn. Jahrb.* 4, 1863, *a*—Roman collection, *b, c, d*.



Fig. 156. II, Tall, tapering wine flasks.—Mouth with double collar or floreate lip, Germany and Syria.



Fig. 156. III, Wine and oil flasks, middle of 2d century.—Gorga Collection, probably Syrian.

Pear-shaped or spherical body with slender, but not tall, neck decorated with a neckband. Handles mostly flat, blue-green. Some have two handles, sometimes ending at the center of the neck. With plain or crenulated foot ring.—Text Fig. 156, III.

Type similar to the last mentioned, but the flask is compressed sideways, being pear-shaped in one direction, but almost cylindrical in the other.—Text Fig. 157, *a-c*.

Squatty pitchers with a single handle, wide mouth with narrow lip rim, flat

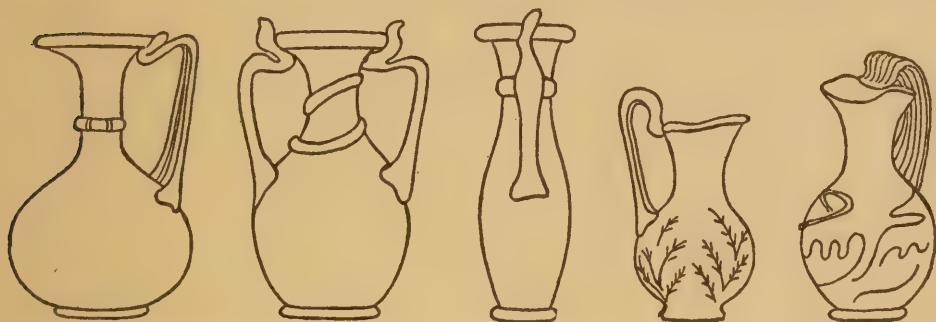
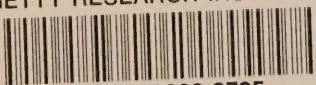


Fig. 157. Wine flasks and pitchers.—Syrian, *a, b, c*—after Kisa, 113, 118, Germany, but rare in Syria.

handle, rather wide neck. Body decorated with overlaid threads in form of serpent windings or palm leaves. These are pitchers rather than flasks.—Text Fig. 157, *d, e*. First half of 2d century A.D.



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